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COMISIÓN SOBRE EL DESARROLLO SOSTENIBLE
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Nueva York, 18 de abril a 3 de mayo de 1996
Tema 3 del programa

COMPONENTES INTERSECTORIALES, PRESTANDO ATENCIÓN ESPECIAL A LOS ELEMENTOS DECISIVOS DE LA SOSTENIBILIDAD

Carta de fecha 19 de abril de 1996 dirigida al Secretario General por el Ministro del Medio Ambiente de Noruega

A raíz de la iniciativa de Noruega sobre producción y consumo sostenibles, y como consecuencia de las decisiones adoptadas por la Comisión en 1995, Noruega ha apoyado la labor de la Organización de Cooperación y Desarrollo Económicos (OCDE) en esa esfera.

A fin de facilitar la labor de la Comisión sobre esta cuestión en el período de sesiones de 1996, Noruega agradecería que el informe de la OCDE de la reunión de Rosendal organizada por Noruega se distribuyera como documento oficial*.

En mi discurso ante la Comisión me referiré a este informe, por lo que mucho agradeceré que se ponga a disposición de las delegaciones.

(Firmado) Thorbjorn BERNTSEN
Ministro del Medio Ambiente
Gobierno de Noruega

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* El informe de la reunión se distribuye únicamente en el idioma de su presentación.

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1 INTRODUCTION

1.1 THE OECD WORK PROGRAMME ON SUSTAINABLE CONSUMPTION AND PRODUCTION

In June 1993, the OECD Ministerial Council requested the OECD to examine the relationship between consumption and production patterns and sustainable development. The Environment Directorate has concentrated its efforts on the development of an OECD Work Programme for 1995-96, and on contributing to the development of an international work programme on sustainable consumption and production, under the aegis of the UN Commission on Sustainable Development. Recent activities include the organisation of an Experts Seminar at MIT, Boston, USA (December 1994), supporting the Oslo Ministerial Roundtable on Sustainable Consumption (February 1995), the facilitation of information exchange through the OECD Informal Contact Group on sustainable consumption and the Rosendal Workshop which is reported on in this paper.

The OECD Work Programme involves three elements:

- Clarifying the Conceptual Framework;
- Identifying Policy Options and Tools;
- Monitoring and Evaluating Progress.

1.2 THE ROSENDAL WORKSHOP

The Rosendal workshop, *"Sustainable Consumption and Production: Clarifying the Concepts"* was organised by the OECD and hosted by the Environment Ministry of Norway, from 2-4 July 1995. It was intended to make a major contribution to the first element of the OECD Work Programme by providing for detailed discussion among some 25 policy makers and other experts who attended the event.

The workshop had three key objectives:

- to identify and examine broad concepts that have been advocated within the international community to effect changes in levels and patterns of consumption and production;

- to assess the potential utility of these concepts for policy development and implementation, thereby highlighting those which appear most promising;
- to clarify boundaries between 'sustainable development' and 'sustainable consumption and production'.

More broadly, the workshop aimed at improving the conceptual basis for policy development in OECD countries and helping to focus the efforts of other international organisations on the most promising conceptual approaches to developing policies for more sustainable patterns of production and consumption.

1.2.1 Workshop Discussion Paper

The starting point for workshop discussions was a background paper *Sustainable Consumption and Production: Clarifying the Concepts*, presented in *Annex A* of this report.

The purpose of the paper was to expand and sharpen debate among experts attending the workshop. It was prepared for the OECD by Environmental Resources Management (ERM) UK: its views are those of the consultants and do not necessarily reflect those of the OECD or workshop participants.

The paper describes a series of concepts and analyses them in terms of their potential usefulness to policy makers who are interested in developing and implementing measures to achieve more sustainable consumption and production patterns.

The concepts were selected by the OECD Environment Directorate to represent the lines of argument that are most often raised in the current discussion about sustainable consumption and production. They are:

- *carrying capacity* (a defined environment's maximum persistently supportable load, usually expressed in terms of population numbers of a defined species);

- *the steady state economy* (a human economy characterised by constant population, capital stocks and rate of material/energy throughput);

- *environmental utilisation space or ecospace* (the capacity of the biosphere's environmental functions to support human economic activities, sometimes defined at a national or per capita level according to a 'global fair shares' principle);

- *ecological footprint* (the area of land functionally required to support a community which lies beyond the land occupied by that community - 'appropriated carrying capacity');

- *ecological rucksack* (the total mass of material flow 'carried by' an item of consumption in the course of its life cycle);

- *natural resource accounting and green GDP* (alternative systems of national accounting and performance measures, which incorporate ecological and human welfare considerations);

- *eco-efficiency* (more efficient use of materials and energy in order to reduce economic costs and environmental impacts - 'more from less').

2 *WORKSHOP REPORT*

2.1 *CLARIFYING THE CONCEPTS*

Day 1 of the workshop opened with a plenary session which reviewed the series of concepts set out in the background paper. In the course of discussion the following key points were raised.

- The background paper was felt to provide a good and reasonably comprehensive point of departure for discussions. The additional

concepts of industrial ecology and environmental debt were noted as requiring further attention.

- The concepts under discussion operate at different levels. Carrying capacity was identified as a science-based 'foundation' concept and guiding principle. Ecospace, ecological footprints and rucksacks and the steady state economy serve as metaphors for social change and offer quantitative approaches to assist in objective setting. Eco-efficiency is a broad strategy, applicable at micro or macro-level, while green accounting and green GDP are tools for action.

- With the possible exception of eco-efficiency, the concepts rest on the premise that there are biophysical limits to current economic growth. However, they do not all imply that economic growth cannot continue - two key options for 'expanding' economies were mentioned:

  - society can pursue *qualitative economic development*, in which the quality of goods and services is improved through resource efficient processes and social organisation but output, in terms of physical volume, does not increase; and

  - society can pursue selective *quantitative economic growth*, which remains viable if, for example, certain sectors expand but their growth is offset by greater resource efficiency (leading to reduced inputs) and/or contraction in other economic activities.

- There exist assumptions within concepts (particularly ecological footprints and ecological rucksacks) about the damaging effects of international trade and the likely benefits of achieving new (reduced or more efficient) patterns of consumption and production. Two main points were made in relation to this:

  - a simplistic view of developing countries supplying the industrialised world with raw materials and receiving finished goods in return is no longer accurate. Patterns of world trade are complex and changing rapidly as manufacturing and service industries relocate at a global level. It is therefore important to recognise the **reciprocal** nature of consumption patterns within and between countries. Policies for more sustainable

consumption/production patterns should focus on creating an 'environmental balance of trade' rather than achieving regional self-sufficiency. The phenomenon of 'appropriated carrying capacity' may be best addressed by an open trading system which is managed to bring mutual benefits environmentally and economically.

- It is currently unclear what the consequences for world trade might be of any major shift in consumption patterns by developed countries.

- Sustainable consumption and production, by definition, concern audiences outside the world of policy making. Whatever the merits of sophisticated new concepts, it should be remembered that politicians and the public have an intuitive understanding of carrying capacity and thresholds and the notion of 'living within our means'. This is an important foundation for policy making.

- Concepts such as ecological footprints and ecospace have particular value as descriptive ideas. They can be used as a means of picturing the nature and extent of environmental damage and the forces causing it. They particularly highlight the current inequity of consumption levels within countries and between rich and poor nations: they can serve to inspire the kind of changes needed in industrialised countries.

- The implications which flow from the various concepts should never be regarded as prescriptive. In seeking to realise their objectives, policy makers should beware of creating a 'sustainable' society in which people do not wish to live.

2.1.1 Discussion Groups

Following the plenary discussion, participants split into a number of break-out discussion groups and addressed the questions:

- *whether greater clarification of concepts is needed;*
- *whether additional concepts are needed;*

- *what policies to encourage more sustainable consumption and production could be pursued now (even in the absence of consensus on the definition and scope of sustainable consumption and production)?*

The outcome of the group discussions is summarised below.

Is There a Need for Greater Clarification of Concepts?

Concepts are inherently 'fuzzy': their function is to provide a mobilising vision as much as to analyse and explain. It is not always helpful to seek to turn them into scientific theories.

It is useful to identify the interlinkages between concepts - despite their different starting points and philosophies there are many common elements which can serve as a basis for policy thinking.

It is important to recognise explicitly the subjective judgements and assumptions underpinning concepts, and the objectives they are seeking to achieve.

An important issue requiring further exploration in some concepts is the notion of social choice. Scientific assessment of the earth's capacity to sustain human activities influences, but does not determine, policy making. Establishing critical loads, for example, involves normative judgements as well as scientific study. Concepts can be most helpful when they explicitly recognise the need for environmental/economic/social trade-offs and build their 'future visions' around this political process.

Is There a Need for Additional Concepts?

It was noted by workshop participants that *industrial ecology* might serve as a unifying concept, linking the ideas of carrying capacity, ecospace, eco-efficiency and cleaner production. Industrial ecology is far-reaching in its use of the metaphor of metabolism to analyse production and consumption by industry, government, organisations and consumers, and the interactions between them. However, the concept was generally felt to be of greatest interest to business; it remains unclear how industrial ecology can be applied in demand side measures, especially at individual or household level.

The concept of *Foodmiles*, or the distance travelled from production to market by agricultural products, was noted as another indicator of the international environmental impacts of rich consumer lifestyles. A report by the UK-based SAFE Alliance, which developed the concept, shows that UK food imports by air more than doubled during the 1980s, leading to increased energy consumption and air pollution.

Environmental debt - defined in Sweden as the cost of repairing all environmental damage in the country that is capable of being repaired - was agreed to be a concept of great potential value. Environmental debt has already been operationalised in the sense that the Swedish government has made a commitment that the national environmental debt will not be permitted to rise any further.

Interest was also expressed in whether researchers or policy makers in developing or newly industrialising countries have proposed concepts relating to sustainable consumption and production which might differ significantly from those under consideration at the workshop.

What Policies Could be Pursued Now?

There was agreement that *correcting distorted pricing systems*, which currently send the wrong signals to producers and consumers, still represents the most effective course of government action.

- Eco-taxes on products and materials remain difficult to implement, though it was suggested that some industries are becoming more receptive to such measures, if they are introduced with due care for fiscal neutrality and maintaining national competitiveness.

- Reduction/removal of subsidies, especially in the energy, agriculture and transport sectors, was felt to be under-explored as a policy option in most OECD countries. Much information relating to the extent and distribution of national subsidies is lacking, and too little is known of the costs and benefits which might follow from their removal. Research in this area is urgently needed.

In the short term, *increasing information to producers and consumers* is regarded as a 'no regrets' option. Measures include:

- more product information;
- practical guidance (sustainability 'tips') to individuals and households;
- indicators to broadcast the state of the environment and progress towards targets.

Demonstration projects to pilot and publicise alternative products, services and lifestyles were felt to be a useful and cost efficient way to learn lessons and encourage change.

2.2 *MOVING FROM CONCEPTS TO POLICY DEVELOPMENT*

The second session of the workshop identified a number of concepts as being especially promising for policy development in that they provide:

- a quantitative basis for decision making (carrying capacity);
- a quantitative basis for, and moral guide to, objective setting (ecospace):
- a set of practical ideas to improve economic and environmental performance (eco-efficiency).

Participants divided into two discussion groups to consider various issues involved in translating these concepts into policies for more sustainable consumption and production:

- the use of targets and objectives;
- allocation issues;
- appropriate scale of action; and
- scope of government influence.

2.2.1 *Carrying Capacity and Ecospace*

Carrying capacity is most easily defined at a local level; for practical policy making, the notion of global carrying capacity is almost meaningless. Carrying capacity was agreed to be an essential starting point for discussions about sustainable consumption but it contains inherent problems relating to implementation. These include:

- scientific uncertainty, which is a major constraint on setting and defending long term goals and targets for reducing resource use/pollution;

- the 'ideological baggage' of the limits-to-growth controversy dating from the 1960s, which remains a political problem.

Target setting can only be handled as an ongoing process, subject to revision in the light of new knowledge, technical innovation and changing values.

Critical loads represent society's choices about limits; they are based on scientific estimates of carrying capacity and value judgements about what is important and what environmental/economic/social trade-offs are acceptable. Critical loads, not carrying capacity, are the real operational substance of political/ environmental debate. The concept of ecospace could be helpful in this debate, for example, in negotiations over access to resources and to the right to pollute. Such debates and negotiations are already in evidence, for example, over whether/how much the developed world should pay poorer countries to undertake biodiversity protection measures.

The concept of 'environmental capacity', or development thresholds defined in terms of environmental critical loads and social perceptions of acceptable limits, was felt to be especially useful in guiding planning policy (eg land use and facility developments) at local and regional level. Demand side measures to control visitor numbers to tourist attractions have been introduced following environmental capacity studies of National Parks in the USA and historic cities such as Venice.

The core issue relating to policy development based on scientifically and/or socially determined 'limits' is that of allocation of access to environmental goods and services. This is necessarily a political judgement. Key factors

include: relative strength of interested parties in the decision making process, willingness to pay, traditional ownership ('grandfathering rights') and equity considerations. Ecospace was felt to offer useful guidance in the form of:

- illustrating present inequities of distribution;
- suggesting long term goals for greater equity;
- providing quantitative indicators of sustainable resource use and waste generation.

Participants expressed doubts about the ability of carrying capacity or critical loads to provide the *guiding principle* of policies for sustainable consumption and production. While a scientific basis for action is necessary, science clearly needs reinforcing by social, economic, quality of life or other arguments which:

- focus on evident problems; and
- encourage agreement that action is necessary.

Some speakers agreed that the concept of ecospace is well suited to describing environmental impacts and social inequities but contested the idea that it could be helpful in pragmatic allocation decisions, especially at international level. A key objection is that 'global fair shares' is not in fact equitable because it is unlikely to allow sufficient 'space' for developing countries to achieve the growth levels they need for real poverty alleviation and social improvement.

2.2.2 *Eco-Efficiency*

Eco-efficiency is subject to different interpretations. Business tends to regard it as a strategy for achieving growth more efficiently ie with lower financial and environmental costs. NGOs tend to see it as a more fundamental means to reduce absolute levels of energy and material consumption. There is therefore some confusion over goals and targets.

To date, business and some governments have set targets in terms of improved unit efficiency. For example, many Dutch industry sectors have committed to achieving 20 per cent energy efficiency improvements but no absolute reduction

in energy use is implied. By contrast, some environmental experts have suggested targets which utilise efficiency measures in order to achieve dramatic cuts in consumption levels: the "Factor 10 Club" has proposed an average ten-fold increase in current levels of resource productivity over the next 30-50 years in order to reduce by half current global flows of non-renewable materials.

Key problems were identified in relation to both approaches:

- progress on efficiency targets set at enterprise level is hard to verify, both in terms of company performance and environmental outcomes;
- targets requiring absolute reductions in consumption levels are hard to justify: many resources are not currently perceived to be in short supply and there is no certainty that reduced consumption will result in 'sustainability'.

Despite these obstacles, eco-efficiency was felt to represent a flexible and pragmatic approach, suitable for translating into action at national, regional and local level, by governments, industry, organisations and households.

Government was felt to have a steering role in:

- defining problems;
- researching and communicating the techniques for, and implications of, major efficiency improvements;
- creating appropriate incentive frameworks;
- developing public sector infrastructure to enable efficient behaviour;
- promoting and implementing international agreements;
- setting an example eg through implementing 'in-house' efficiency programmes (greening of government);
- monitoring and reporting progress in all sectors.

Steps in the right direction were agreed to be more important than consensus on long term goals.

Encouraging eco-efficiency was generally supported as a pragmatic strategy with potential political and economic appeal. Short to medium term efficiency targets are likely to encourage 'win-win' management and planning choices. Ambitious, long-term goals, such as the ten-fold increase in resource productivity proposed by the Factor 10 Club, were felt to represent a very challenging target.

Eco-efficiency was also felt to be applicable to demand side measures aimed at, or undertaken by, households. However, the term 'eco-efficiency' was felt to be too obscure for popular communication; a more meaningful phrase is required.

As with carrying capacity, the concept of eco-efficiency was felt to be insufficient on its own as a basis for policy making. Wider understanding of interlinkages between economic activities and environmental damage, driving forces of change and the psychological/ethical motives of producer and consumer behaviour will be essential to achieving efficiency gains in consumption and production levels or patterns which will have a measurable impact.

2.3 *POLICY MEASURES: SOME PRACTICAL PROPOSALS*

The second day of the workshop also involved a brainstorming session during which participants listed possible policy measures which could take forward the concepts of carrying capacity/critical loads and eco-efficiency into practical action. These measures are summarised in *Box 2.3a*.

Box 2.3a Approaches to Encouraging Sustainable Consumption and Production Suggested by Workshop Participants

Economic Instruments	• Incremental tax shift from labour to resource use and pollution • Progressive reduction of environmentally damaging subsidies • Zero VAT rating for the top 10 per cent of energy efficient appliances • Road pricing, congestion charges and petrol price increases above the rate of inflation • Tax incentives for small cars
Regulation	• Building regulations to require dual piping systems for domestic water supplies • EIA required for government procurement • Environmental specification bands to be drawn up for government procurement (eg allowing lowest cost purchase within bands) • Empowerment of consumer organisations through increased scope of action and funding • Explicit requirements for technology sharing to widen choice of environmentally benign consumer products • Promotion of life cycle analysis within eco-labelling framework • Use electronic information systems to inform/promote environmentally beneficial behaviour • Environmental education in pre-school education system
Social Instruments	• Reference was made to the wide range of infrastructural and lifestyle changes proposed in the report of the workshop *Facilities for a Sustainable Household*, hosted by the Ministry of Environment of the Netherlands, Zeist, the Netherlands, January 1995. • Local infrastructure and facilities to enable more sustainable behaviour, coupled with public awareness campaigns utilising advertising, icons, symbolism • Environmental product/service information targeted at procurement agents of government and companies/organisations
Research & Development	• Incentives for industry to undertake market research on the psychology of consumer purchasing behaviour • Trend analysis of most successful best practice in industry • Introduction of comparative ranking of multi-nationals' eco-audits • Local demonstration projects of 'sustainable' lifestyles to understand preconditions for successful behaviour change • Promote and develop opportunities for environmental job creation
International Cooperation	• Stronger internalisation of environmental costs should be pursued in international trade negotiations • Globally compatible eco-labelling scheme, covering environmental inputs and outputs, for products and services • Promote use of ISO 14000 and develop version for SMEs

2.4 *CONCLUSIONS*

On the second day of the workshop, participants re-examined the full array of concepts under discussion and reached consensus on a number of conclusions. One conclusion highlighted the importance of international cooperation in working towards more sustainable consumption and production patterns. In response, a number of participants outlined relevant work programmes: these are summarised at the end of this section.

Conclusion 1

In pursuit of a conceptual framework for work on sustainable consumption and production, there appears to be a hierarchical relationship flowing from a *core concept*, carrying capacity (and related ideas such as critical loads, ecospace and ecological footprints), through *strategic approaches*, notably eco-efficiency, to *tools for action* (including green accounting, ecological tax/price reform, design for environment).

Conclusion 2

Encouraging eco-efficiency is currently seen as the most promising strategy, not only for business, but also for Governments and households. It has significant potential as a basis for addressing a wide range of environmental problems. The value of an eco-efficiency strategy could be further enhanced by setting targets. Carrying capacity and ecospace can provide a foundation from which to derive such targets.

Conclusion 3

It was recognised that, in addition to their value for target setting, concepts such as carrying capacity and critical loads probably have the most intuitive meaning for politicians and the public.

Conclusion 4

Ecospace, ecological footprints and ecological rucksacks have value as descriptive concepts that can be used to illustrate environmental damage and the relationships between economy and environment. They all embrace the notion of ecological limits. It was recognised that the distributional issues raised by the use of these concepts are politically very sensitive and that their value for setting normative objectives needs further exploration.

Conclusion 5

There is a need to develop more effective parameters, in particular environmental indicators and green accounting systems, which are better able to define, measure and integrate environmental/economic problems and to measure the effectiveness of policy implementation.

Conclusion 6

A common position regarding the nature, context and size of environmental problems to be addressed is a precondition for the effective introduction of policy tools. Even where scientific uncertainty exists, this should not prevent planning, policy and implementation initiatives for more sustainable consumption and production.

Conclusion 7

The discussions on concepts indicated a need for rethinking the relationship between 'North' and 'South'. This is especially relevant for trade and international negotiations. For example, reduced consumption in the 'North' will not automatically lead to increased consumption in the 'South'. More needs to be done to clarify global interlinkages.

Conclusion 8

Sustainable consumption and production objectives, and policies to achieve them, should focus on the reduction of energy and material flows and their harmful impacts. These policies should take into account their potential impacts in the wider economic and social sphere, both within and beyond OECD countries.

Conclusion 9

International cooperation will be essential in developing policies to encourage more sustainable consumption and production. Reflecting the need for continued international initiatives, representatives from the Organisation for Economic Cooperation and Development (OECD), the UN Commission on Sustainable Development (UNCSD), the United Nations Environment Programme (UNEP) and the World Business Council for Sustainable Development (WBCSD) then outlined their work programmes and forthcoming events which will take forward work on sustainable consumption and production.

2.4.1 OECD

The OECD Work Programme on Sustainable Consumption and Production, 1995-96, has been developed in response to the high priority accorded the subject by the UN CSD and within the OECD's Environment Policy Committee. The Programme is led by the Environment Directorate but involves other OECD Directorates and affiliated agencies. The three elements of the Programme involve:

- clarifying the conceptual framework;
- identifying policy options and tools; and
- monitoring and evaluating progress.

It is expected that the second element will begin with a study of the transport sector, to determine environmental, economic and social impacts of current sectoral activity, identify driving forces and trends and to identify potentially efficient and effective mixes of policy instruments to influence consumption and production patterns in the sector.

Interim results of the Work Programme as a whole will be presented to the CSD before the 1996 meeting and a final synthesis report is scheduled for late 1996, in time for the five-year review of Agenda 21.

2.4.2 UN CSD

The third session of the Commission on Sustainable Development (April 1995) adopted a work programme on changing consumption and production patterns. The CSD Secretariat is now building on inputs received from a number of countries and organisations, attempting to synthesise ideas and coordinate implementing national actions. The work programme involves five elements:

- development of long term projections (time horizon of 40 years) to illustrate the consequences of social and economic development trends on consumption and production patterns and their associated environmental impacts. This element is a synthesis of existing studies;

- comparison of social, economic and regulatory policy instruments and packages for achieving change. This element is based on case studies

undertaken in developed and developing countries; forthcoming workshops in Korea and Brazil will also provide information;

- further study of the impacts of changes in consumption and production in industrialised countries on development in poorer countries. The focus will be on trade implications of eg eco-labelling;

- work with national governments to secure commitments to action on sustainable consumption and production, including quantified objectives and agreements on monitoring;

- revise UN guidelines for consumer protection to incorporate sustainability considerations.

Sustainable consumption and production is a key area in the CSD's overall work programme and is expected to become a central policy issue in 1996.

2.4.3 WBCSD

The World Business Council for Sustainable Development has established a working group on Sustainable Production and Consumption, which will shortly merge with a WBCSD working group on eco-efficiency. The working group's programme aims at [1]:

- moving the debate from one which may present barriers and pressure for business to one of opportunities for commercial enterprises;

- identifying strategies and frameworks that satisfy consumer demand and societal needs while promoting environmental quality;

- guiding the agenda so as to avoid stifling competition, economic growth and technological innovation - all necessary components in the achievement of sustainable production and consumption;

- highlighting business accomplishments in moving towards sustainable production and consumption, thereby providing a vehicle for the

[1] WBCSD, *Sustainable Production and Consumption: Phase 1: Definition and Boundaries*, draft document, May 1995.

business community to shape the policy direction of changes in production and consumption patterns.

The WBCSD has adopted a 'platform strategy' to forward this agenda: key events over the next year include:

- an eco-efficiency workshop, hosted by Dow Chemical in Washington DC;
- a workshop on the role of marketing and advertising in promoting more sustainable consumption patterns (Oslo, August 1995);
- a workshop on sustainable consumption and eco-efficiency (Davos 1996);
- the fourth CSD meeting (New York, April 1996); and
- the Summit of the Americas, where WBCSD will chair one of the events.

2.4.4 UNEP

UNEP Industry and Environment launched its Cleaner Production Programme in 1990 with the goal of encouraging countries to move away from end-of-pipe solutions and towards a preventive approach to reducing industry's impact on the environment. The Programme shares many of the concerns and objectives of the sustainable consumption and production agenda; for example, a UNEP working group is currently studying and disseminating information on sustainable product development. Significant UNEP Industry and Environment programmes and events include:

- ongoing establishment of National Cleaner Production Centres (NCPCs) in a joint venture with UNIDO;
- production of a primer on LCA;
- environmental impact assessments of major technology related decisions eg the transfer of hazardous wastes;
- preparation of a training kit on environmental management systems for SMEs to help them implement ISO 14000;

- seminar on the inclusion of environmental issues in the curricula of business schools (September 1995);

- cleaner production seminars in cooperation with the Wuppertal and Stockholm Institutes;

- seminar to evaluate progress on the Cleaner Production Programme (Oxford, September 1996).

The European Regional Office of UNEP is providing a platform for policy discussion in cooperation with Friends of the Earth Europe. A seminar will be held in September, 1995 to discuss the report *Towards Sustainable Europe*, produced by the Wuppertal Institute and FoE, and to examine the role of various social actors in achieving change.

Annex A

OECD Workshop

Sustainable Consumption and Production:
Clarifying the Concepts

2-4 July, Rosendal, Norway

Background Paper

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INTRODUCTION

Sustainable consumption was launched as a serious policy issue at the Rio Earth Summit. Agenda 21 stated that *"the major cause of the continued deterioration of the global environment is the unsustainable pattern of consumption and production, particularly in industrialised countries..."* [1] and called on developed countries to take the lead in promoting and achieving more sustainable consumption patterns.

The OECD has responded to the challenge of Agenda 21, and subsequent calls for action by the Commission on Sustainable Development, by undertaking a work programme on Sustainable Production and Consumption. The programme will stress management of the **demand** side of economic activity, rather than control over **production processes** which has predominated in environmental policy to date. The term sustainable consumption, as used in this paper, embraces both end-use consumers and producers in their role as consumers of energy, raw materials, land and biodiversity.

The first element of the OECD work programme, "Clarifying the Concepts", aims to contribute to debate on the subject by examining concepts which propose future visions of more sustainable consumption patterns and suggest means of achieving them.

This paper has been prepared on the basis of a literature review of a number of concepts, identified by the OECD secretariat as those which, to date, have most often been introduced into the debate surrounding the need to modify consumption patterns. The paper also draws on interviews with experts associated with the development of the concepts or related ideas on sustainable consumption. Concepts reviewed are:

- carrying capacity;
- environmental utilisation space or ecospace;
- the steady state economy;
- ecological 'footprints' and ecological 'rucksacks';
- green accounting (including green GDP and indicators);
- eco-efficiency (including the utilisation-focused economy).

The purpose of this paper is to analyse these concepts in terms of their potential utility in the development and implementation of policies for sustainable consumption. A key objective is to offer guidance on 'drawing the boundaries' between sustainable development and sustainable consumption as a policy area.

A further objective is to expand and sharpen the debate by encouraging international experts in discussion of the various concepts, with a focus on how they might lead to promising policy approaches which may be of value to the OECD's work programme.

It is important to note that concepts are overarching intellectual frameworks which shape ideas but cannot tell us what to do. A fundamental problem in seeking to translate any of the concepts into operational form is that OECD countries have not yet agreed on what are priority 'unsustainable consumption patterns'.

3.1 SUSTAINABLE DEVELOPMENT: SOME OBSERVATIONS

The policy and academic debate surrounding sustainable development at global level revolves essentially around three key issues which have significant implications for environmental policy:

- ***Population Growth.*** Global population has more than doubled since 1950 and is projected to grow from the present 5.5 billion to about 8.5 billion by 2025. Growth is occurring disproportionately fast in the developing countries where institutional/economic/social systems are currently less able to provide for their population's well-being. The world's population is urbanising faster than it is growing: between now and 2025, the world's urban population is likely to triple [2].

- ***Economic Growth.*** Global economic output has increased five-fold since 1950. World commercial energy consumption rose by 45 per cent between 1971 and 1991. Total world consumption of metals, a good indicator of materials demand, rose sharply between 1977 and 1991: aluminium (20%), nickel (37%), zinc (21%)[1]. Improvements in energy and materials efficiency have been more than offset by increases in volume output.

- ***Poverty and Global Inequity.*** There is an enormous wealth and income disparity between developed and developing countries. Average 1991 GDP per capita was $18,988 in OECD countries, compared with $2,377 for developing countries. Disparities within countries can be equally great, creating social tension and encouraging dissatisfaction with (sometimes adequate) living standards. Despite faster percentage economic growth in the developing countries over recent decades, the global wealth gap has continued to grow. The share of global income

going to the richest 20% of the world's people rose from 70 per cent in 1960 to 83 per cent in 1989 [3].

Projected increases in human population numbers and levels of economic output are often identified as the key unsustainable trends in modern society; they constitute the driving forces behind increased load on the environment. Within these broad trends there is little clarity over precisely what is, and is not, sustainable. Opinion also divides sharply over the capacity of technological advance and the operation of the market to overcome pollution problems and perceived resource scarcities.

Poverty and the wealth gap are similarly identified as one of the key drivers of unsustainable environmental degradation. According to the Worldwatch Institute, *"people at either end of the income spectrum are far more likely than those in the middle to damage the earth's ecological health - the rich because of their high consumption of energy, raw materials and manufactured goods, and the poor because they must often cut trees, grow crops, or graze cattle in ways harmful to the earth merely to survive from one day to the next".* [4]

The current sustainable development policy 'package', as discussed in fora such as the CSD and IUCN/IIED, is based on pursuing objectives which integrate economic, social and environmental policies in order to:

- avoid and repair environmental damage;
- promote economic development; and
- reduce poverty and inequity at national and global level.

These aims are summarised in *Table 1.1a*. The table indicates the complex interlinkages between problems and policy responses. Two further factors are noted:

- the bulk of national and international policy making, outside the environmental sphere, aims to promote, not contain, economic growth;

- key 'megatrends' in global society such as technological advance and the spread of Western consumer culture, profoundly affect (both positively and negatively) the nature and extent of population and economic growth, consequent environmental impacts and the options available to tackle them. Yet they remain largely beyond the reach (or consideration) of current policy making in any government department.

3.2 *SUSTAINABLE DEVELOPMENT AND SUSTAINABLE CONSUMPTION: DRAWING PRELIMINARY BOUNDARIES*

A sustainable world may be defined as one in which human activities do not undermine the long term productivity of natural systems. It is generally accepted that some loss of natural capital (resources and environmental services) can be sustainably substituted by human made capital (knowledge, technology). It is also widely, though not universally, accepted that some natural resources and services cannot be wholly substituted: topsoil, fresh water, operation of the major nutrient cycles.

Consumption and production is the essence of economic activity; it involves the utilisation of natural resources, their transformation into products and services and their ultimate disposal or dissipation into the environment as wastes. Traditionally, as economies expand, overall levels of resource use and waste generation rise.

Sustainable consumption, as an issue in the 1970s, centred around the belief that economic growth was inherently limited by the finite nature of fossil fuel energy, minerals and other non-renewable resources. This 'no-growth' position has since been largely discredited on the grounds that it failed to give due weight to the ability of markets to stimulate technological substitutes as scarcities emerge.

Concern has now shifted to other potentially limiting factors, notably:

- the degradation of renewable resources, particularly agricultural land;
- the accelerating rate of species loss;
- the accumulation of emissions and wastes in the environment whose effects, particularly in combination, represent a largely unknown risk (eg toxification, climate change).

Much research and policy thinking on sustainable consumption and production therefore centres on utilising renewable (and non-renewable) resources more efficiently and developing 'closed loop' production/ consumption systems which prevent the escape of wastes into the environment. Efficiency and closed loop systems play a key role in some of the concepts reviewed in this paper.

This essentially environmental perspective has been supplemented by concerns over the inequitable social consequences of modern industrial consumption and production patterns and the desire for a fundamental change in the value systems which underlie 'Western' consumer culture. These concerns have been

promoted largely by the development community and environmental pressure groups respectively.

As the ecological, social and ethical elements of the sustainability debate have developed, certain *assumptions* about what constitutes sustainable development, or the conditions obtaining in a sustainable world, have emerged in recent years. Some of these assumptions now exert a pervasive influence in many discussions about sustainable consumption and production and they are evident in a number of the concepts discussed in this paper. Assumptions include the following:

1) A sustainable world is a world in a state of, or approaching, *equilibrium*. Many of the concepts examined in this paper favour the pursuit of equilibrium, either literally (achieving the technical state of dynamic equilibrium between natural and economic systems) or, more figuratively, through 'restoring lost balance'. The support of some NGOs, in particular, for achieving sustainable, equilibrium levels of consumption appears to be based partly on the perceived attractions of slowing the pace of change and living a simpler life.

2) A sustainable world is likely to involve *reduced* levels of production and consumption in the industrialised world. The change is seen variously as requiring an absolute reduction in resource use and a return to simpler lifestyles (deep ecology), a maintenance of present standards of living, achieved through greatly increased energy and materials efficiency (eco-efficiency), and/or a rethinking of the notion of 'quality of life' to emphasise less materialistic goals.

3) A sustainable world will be a more *equitable* world. Present inequities are not only unjust and morally offensive, they are unsustainable because continued poverty will lead to ecological catastrophe, social unrest and the loss of the resource base and export markets on which the comfortable North depends [5]. An allied assumption is that reduced consumption in the North will lead to increased development in the South.

These assumptions are especially strong in much NGO thinking on sustainable consumption and can also be detected in recent statements arising out of international government/NGO meetings (see *Box 1.2a*).

Achieving more sustainable levels and/or patterns of consumption and production is clearly a vital component of the broader sustainable development agenda. However, if sustainable consumption and production is to be

successfully pursued as a distinct policy area, it would seem necessary to draw clear boundaries around the subject, in order to clarify objectives and develop appropriate policy tools.

This paper takes the position that sustainable consumption should be approached from the ecological perspective; issues and assumptions about levels and patterns of energy use, material throughput and use of available land area should be central to the sustainable consumption debate. The policy focus should be to minimise the risk of irretrievable damage to the earth's life-support functions. This approach is in line with the environmental policy perspective of the OECD's work programme and is pragmatic in that 'sustainability' as a policy issue is still largely the province of environmental agencies.

There are additional reasons for taking this position:

- The goal of biophysical equilibrium (assumption 1) is problematic from a governmental point of view. Equilibrium states can never be defined (or agreed) and are too long-term for practical policy making. In addition, economic and ecological systems are so complex that it is hardly sensible to imagine they can be controlled by human institutions.

- The equation of sustainability and equity (assumption 3) is logically dubious. An equitable world is desirable for its own sake. It is likely that a sustainable world cannot be achieved without a greater degree of equity. But a more equitable world would not necessarily be more sustainable. Therefore, it seems important to draw a distinction between the distributional **consequences** (equity) of policies for more sustainable consumption, which must be taken into account, and the pursuit of equity as a key **objective** and necessary condition of these policies.

The analysis presented in *Section 2* will demonstrate that the essence of all the concepts under review, in their relation to sustainable consumption, may be crudely summarised as "do more with less". The principal task is seen as being the reduction of quantitative levels of energy and material consumption in rich countries and the richer sections of developing nations.

From this perspective, the paper explores what the concepts have to offer in terms of visions, policy starting points and practical tools for implementation. The next step, to be undertaken in later stages of the OECD work programme, will be to address the policy questions:

- what **specifically** are the objectives of sustainable consumption policies?
- what mechanisms can best encourage various forms of 'doing **more with** less'?
- who are likely to be the winners and losers in the process?
- how can the pain and disruption of change best be mitigated?

Box 1.2a: Sustainable Consumption: the Expanding Policy Agenda

Agenda 21 did not define sustainable consumption patterns but clearly indicated the need to focus policy attention on *"the demand for natural resources...and...the efficient use of those resources consistent with the goal of minimising depletion and reducing pollution.* The Rio process discussed two key driving forces of unsustainability: population growth, occurring mainly in developing countries, and 'overconsumption' on the part of the industrialised world. Agenda 21 established all countries' common responsibility for sustainability but pointed out that responsibilities were differentiated. The rich world was given lead responsibility for examining its own levels of consumption. The issue of global inequity was introduced by Agenda 21's statement that *"Measures to be undertaken at the international level for the protection and enhancement of the environment must take fully into account the current imbalances in the global patterns of consumption and production".* (Emphasis added) Thus, a link between unsustainable consumption patterns and current inequities in global resource use and pollution was established.

The first Oslo Symposium on Sustainable Consumption restated the biological basis of consumption patterns. *"Current material flows induce pollution, resource depletion, energy consumption and biodiversity and landscape destruction [which] appear unsustainable by any standard."* However, the working definition of sustainable consumption proposed at the Symposium also emphasised inter-generational equity and introduced the notion of quality of life, presumably as a pragmatic response to the infeasibility of policy measures which might appear to threaten western consumers with a reduced standard of living. *"[Sustainable consumption is] the use of services and related products which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardise the needs of future generations".* [6] (Emphasis added)

The burgeoning policy agenda was confirmed at the second Oslo meeting where the key working document stated that *"sustainable consumption is an umbrella term that brings together a number of key issues, such as meeting needs, enhancing the quality of life, improving resource efficiency, minimising waste, taking a life cycle perspective and taking into account the equity dimension. Integrating these component parts is the central question of how to provide the same or better services to meet the basic requirements of life and the aspirations for improvement for both current and future generations".* [7] (Emphasis added)

4 ANALYSIS OF THE KEY CONCEPTS

This section of the report describes the key characteristics of each of the concepts under review and provides a summary analysis in tabular format. The concepts are then briefly evaluated from the perspective of their potential utility to policy makers. Possibilities for more specific application in policy making are assessed in *Section 3*.

4.1 CARRYING CAPACITY

Biologists define carrying capacity as the maximum population of a given species that can be supported indefinitely by a defined habit. It has traditionally been used as a measure in the management of wildlife, game or agricultural livestock. The notion of limits is fundamental to carrying capacity: when the maximum population level is exceeded, the resource base declines and - at some later date - so will the population.

The human "population explosion" of the last two centuries, and the concurrent growth in industrial output, has not led to consensus regarding human pressure on the earth's carrying capacity: the earth is an undefined habitat and its capacity to support human numbers at a global level is unknown. Pessimists, from Thomas Malthus to Paul Ehrlich, have argued that unchecked population growth will overwhelm the earth's life support functions, leading to environmental, social and economic disaster. Optimists, such as Julian Simon, and many mainstream economists, believe that technological progress and human ingenuity will always overcome biological 'limits'.

A fundamental problem is presented by the uncertainties surrounding the carrying capacity of ecosystems, even at national or regional level; we do not understand the operation of complex, non-linear systems and we cannot measure or predict the point at which population overload (in the sense of significant failure of biological life-support functions) might occur.

Opposing interpretations of carrying capacity in relation to human activities have led to four essentially different approaches to sustainable development and environmental policy making:

- the notion of limits is irrelevant: continued economic growth under free market conditions, technological innovation and human ingenuity will be

capable of overcoming all problems relating to resource scarcity or pollution;

- there are economic, environmental and social benefits to cleaner and more efficient use of resources, but reference to limits and targets is not necessary;

- economic development should be based on the concept of *maintenance of stocks* whereby the total capital base of our economy (environmental, physical and human) is preserved but substitution between different forms of capital is possible ('weak sustainability');

- in addition to maintaining the overall capital base, economic development should preserve substantial parts of environmental capital intact; such capital should be regarded as 'critical' and non-substitutable ('strong sustainability').

Table 2.1a Carrying Capacity

Characteristic	Comment
Intellectual Origins	The intellectual heritage of the idea as applied to human beings on the earth can be traced from the Ancient Greeks and the Bible. The modern argument centres on the dilemma of satisfying the objectives of eco-system preservation and economic growth (especially in developing countries), given current projections of population growth and energy/material intensive production/consumption patterns [8]
Key Factors	Carrying capacity is a quantitative concept: key factors include population numbers and density, affluence and technology (Impact = Population x Affluence x Technology). Concerns focus on depletion rates of renewable and non-renewable resources and the build-up of hazardous wastes in the environment. The point at which depletion or waste accumulation might provoke catastrophic break-down in any of the earth's life supporting functions remains largely unknown.
Underlying Assumptions	Natural ecosystems and human economic systems are inextricably linked and neither can be understood in isolation from the other. There exist definable, though often undefined, limits to the capacity of natural ecosystems to support continued economic growth, which increases human "load" on the earth. Load is a function of population numbers and per capita consumption levels; it embraces both resource consumption and pollution.
Linkage with Sustainable Development	A belief in limits to growth has been the driving force behind the development of environmental economics, pioneered by economists such as Boulding, Daly, Pearce, Repetto, El Serafy and Miller. Recent years have seen a major research effort to develop more systemic (holistic) models which can identify and measure the relationships between the natural environment and the economy. Key objectives of environmental economics include: • development replaces growth as primary economic goal; • natural capital and ecosystem services valued and incorporated into economic accounting; • adjustment of current future discounting techniques; • adjustment of national performance measure (GDP) to account for resource depletion and pollution; • use of integrated ecological/economic models to predict effects of human behaviour; • use of market based incentives to internalise environmental costs.
Linkage with Sustainable Development (cont'd)	The work of environmental economists has been important in translating the largely unquantified concept of limits into techniques available to governments and enterprise. Formidable methodological problems and disagreements remain, for example over valuation techniques and substitutability between stocks.

Characteristic	Comment
Measures/ Indicators	The basic measure of carrying capacity is population numbers per unit area. In ecological growth models, carrying capacity is a constant that expresses the environmental limit by which a population is constrained. In complex ecosystems, this measure involves complicated inter-relationships between mutually dependent species. A common criticism of carrying capacity as applied to humans, is that it fails to take account of the different resource requirements of humans at different levels of economic development or of human capacity to 'expand' carrying capacity through technology. (see *Ecospace* and *Ecological Footprints* for conflicting ideas on this point).
Economic Implications (eg wealth, production/ consumption patterns, competitiveness, employment)	The concept of carrying capacity does not make recommendations or imply specific changes in production and consumption patterns. Its guiding principle is that we operate 'within the earth's limits'. Determining limits, and means of staying within them, is left to the political process.
Trade and Development	Some environmental economists argue that international trade is an inefficient means of exploiting the earth's productive capacity and the quest for export led growth (or the need to earn foreign currency to service debt requirements) often leads to, for example, environmentally damaging agricultural practices, inappropriate industrial development and high energy use and pollution associated with transportation.
Technology	No specific recommendations
Appropriate Scale of Action	Carrying capacity is most easily operationalised at local level, where 'critical loads' can be determined for specified pollutants in specified environments, for example acid deposition levels that can be tolerated by individual heathers. Critical loads are thus determined by science and value judgements about what should be protected. The international nature of threats such as climate change has stimulated efforts to agree (nominal) global critical loads for eg emissions of CO_2 and ozone depleting substances.
Proposed Policy Approaches	Carrying capacity, the most purely scientific of the concepts under discussion, offers the least guidance on 'what we should do'. It is a concept without a firm political or moral context. Carrying capacity as a metaphor for limits and thresholds of change has nonetheless exerted a strong influence on policy makers, stimulating the use of risk assessment and the precautionary principle, action on substance controls and interest in clean technology and financial instruments. Scepticism over the reality of limits, however, has tended to undermine implementation.

4.1.1 The Scope for Government Action

Carrying capacity is undoubtedly the most influential of the concepts under discussion in environmental policy development. First generation environmental laws (substance bans and process controls to protect human health), land use planning (to protect valued habitats and scenery), performance standards and ambient quality objectives are all based, however vaguely, on the notion that our social and economic activities must be controlled in the interests of health, safety and quality of life.

National policy objectives based on stricter calculations of critical loads are rare; a notable exception being the environmental targets established in the National Environmental Policy Plan of the Netherlands. The report *Concern for Tomorrow* (RIVM, 1988) set out environmental quality objectives for the Netherlands, based on critical load analysis, and estimated the load reduction (expressed as percentages of polluting emissions) necessary to achieve them. Despite this scientific origin, the 'sustainable level' of pollution, ie the Netherlands' carrying capacity for economic activity, was ultimately determined through the political process. Environmental quality and pollution reduction targets were agreed only after intense political negotiation and calculation of the likely impact of environmental policies on economic performance (the

environmental goals of the NEPP are intended to be achieved in the context of a doubling of GNP).

Another significant development of recent years has been the signing of International Agreements which recognise limits to global carrying capacity for key pollutants. (These limits are not absolute but represent thresholds beyond which current human activities would probably be severely disrupted). For example, the Montreal Protocol (most recently amended in 1992) aims to eliminate emissions of most ozone-depleting substances - the 'sustainable level' of emissions is not known and carrying capacity has effectively been agreed to be zero. The Climate Change Convention (1992) commits signatory countries to stabilise their emissions of CO_2 at 1990 levels; again sustainable emission limits are not known but stabilisation would represent an important first step.

A key lesson of these agreements appears to be that precise knowledge of carrying capacity is less important than the **perceived** need for action and the ability to agree on goals that can demonstrate progress in the right direction. As scientific understanding and technical possibilities advance, these political agreements on carrying capacity will be continually redefined.

4.2 THE STEADY STATE ECONOMY

The concept of the steady state economy (SSE) was developed as a paradigm of sustainable development by Herman Daly (see *Box 2.2a*). The SSE is defined by four characteristics:

- a constant population of human bodies;
- a constant population or stock of artifacts (exosomatic capital or extensions of human bodies);
- the levels at which the two populations are held constant are sufficient for a good life and sustainable for a long future;
- the rate of throughput of matter-energy by which the two stocks are maintained is reduced to the lowest feasible level. For the population, this means that birth rates are equal to death rates at low levels so that life expectancy is high. For artifacts, it means that production equals depreciation at low levels so that artifacts are long lasting, and depletion and pollution are kept low.

The SSE assumes that the stock of humans and artifacts remains constant while the elements of 'cultural capital' - information, wisdom, distribution of wealth and income, product mix etc - can change.

More recently, Daly has introduced the metaphor of the 'Plimsoll Line' for the environment. Samuel Plimsoll was a British Member of Parliament who, in 1875, proposed that a line be painted on the hulls of ships, indicating the depth to which they could safely be loaded. An environmental Plimsoll line would therefore indicate the 'level' to which the environment can be burdened by economic activity without unacceptable consequences. The level of the mark is an overall constraint within which different economic activities (equivalent to different elements of ship's cargo) can be increased, decreased or moved around. A steady state economy should operate at, or below, the Plimsoll line.

Table 2.2a The Steady State Economy

Characteristic	Comment
Intellectual Origin	The concept as applied to sustainable development owes most to the American environmental economist Herman Daly who set out his ideas in 1977 in *Steady State Economics* [9]. He notes that the concept is not new (citing John Stuart Mill's chapter in *Principles of Political Economy*) and reminds us that the notion of growth as the norm is relatively new in Western thinking.
Key Factors	Daly's work rests on the premise that the human made economy is "an open sub-system of the earth ecosystem, which is finite, non-growing and materially closed". As the economy grows, it incorporates an increasing proportion of the total ecosystem; it must reach a limit at 100% if not before. Sustainable economic growth is therefore, in Daly's view, "an impossibility theorem". A distinction between economic **growth**, conceived and measured in quantitative terms, and economic **development**, conceived in qualitative terms and measured in terms of efficiency ratios
Underlying Assumptions	The steady state economy is a non-growth economy in bio-physical equilibrium with natural systems. A dynamic element is allowed for in terms of human culture but the objective of cultural dynamism is to maintain ecological equilibrium. The steady state economy is achievable only through *"moral growth"* of human society, in which consensus on *"objective values"* takes precedence over technical determinism and enables society consciously to choose a new direction
Linkage with Sustainable Development	**Ecological viability**: The steady state economy depends on the adoption of socio-economic behaviour patterns where a) *stocks* are satisficed' or maintained at a level sufficient for an abundant life for the present generation and ecologically sustainable for a long (but not indefinite) future; b) *service* is maximised, given the constant stock; and c) *throughput* is minimised. The overall goal is sustainable equilibrium between economic and natural systems within the earth's carrying capacity. **Equity**: Daly summarises the right rule of action as that which pursues a *sufficient* per capita income for the greatest number of people over time: *"the basic needs of all present people take priority over future numbers, but the existence of more future people takes priority over the trivial wants of the present"*. Daly notes the difficulty of defining *"sufficient"* (though not *"trivial"*). **Quality of Life**: Daly assumes that beyond some level of sufficiency, further increase in per capita goods does not increase quality of life and may diminish it. Despite the social and economic control required in the SSE, the point is made that freedom is to some extent a function of slack, or the distance between maximum carrying capacity and actual load. A system operating at its carrying capacity has no room for error or the freedom that permits error
Measures/ Indicators	Key macro-level measures identified in *Steady State Economics* are: • **service efficiency**, measured in terms of allocative efficiency (*"does the stock consist of artifacts that people most want to use and are they allocated to the most important uses?"*) and distributive efficiency (*"is the distribution of the stock among alternative people such that the trivial wants of some people do not take precedence over the basic needs of others?"*). • **maintenance efficiency**, measured in terms of durability (lifetime of an individual artifact) and replaceability (how easily can the artifact be replaced?)
Economic Implications (eg wealth, production/ consumption patterns, competitiveness, employment)	The concept of SSE is independent of GDP. Alternative social accounts proposed are to measure the value of service (benefit) and the value of throughput (cost). Economic development is defined in terms of an increase in efficiency ratios, with stock constant, or as an increase in service, with throughput constant. Daly argues that the likely market effects of minimum and maximum income levels, maximum wealth limits and resource depletion quotas (see **Proposed Policy Approaches** later in this table) would be the legitimation of private property and the free market and the removal of incentives for monopolistic behaviour by enterprise, for unionised labour and for distorting subsidies by government. His exposition is too detailed to be adequately summarised in this paper.
Trade and Development	Resource depletion quotas are also proposed for imported raw materials (but not finished goods), enabling control over the 'footprint' effect (see *Section 2.4*). Raw material exporting countries would suffer from reduced export opportunities but are expected to benefit from long term enforced improvement in the management of their own resources. Population control and environmental protection policies are foreseen as possible preconditions for membership of new free-trade blocs.
Technology	A fixed rate of resource depletion (achieved via quotas) is expected to focus technology development on solar energy and renewables.
Appropriate Scale of Action	National, to be followed by internationally coordinated action.

Characteristic	Comment
Proposed Policy Approaches	Daly proposes a centralised 'Distribution Institution' to: • set upper limits to wealth and income and minimum limits to income (though not to wealth), • allocate transferable birth licences to achieve population stability (an idea first proposed by Kenneth Boulding in 1964), • establish depletion quotas to control resource use The allocation of depletion quotas and distribution of income within upper and lower limits would be governed by the market. Distribution of birth licences to be on the basis of equity (one person, one licence) but reallocation via market exchange would be allowed

4.2.1 The Scope for Government Action

The steady state economy is proposed as an alternative to the conventional growth-oriented economic model in which exchange value, abstracted from physical energy and material flows, circulates between firms and households in a closed loop. It is a non-growth economy, maintained at some desired, sufficient level by low rates of maintenance throughput. The concept is intended to reshape our notions of economic growth and, more fundamentally, of what constitutes human progress.

The steady state economy presents a moral and intellectual framework - a new paradigm which will attract the interest of policy makers to the extent that it reflects their own beliefs, values and preferences. The concept's value lies in its possible influence on decision makers at a personal, ethical level. It is clearly not capable of direct translation into policy in any conceivable near term political economy. In particular, achieving and maintaining the steady state economy would require an improbably high level of centralised and consistent control. Apart from the implications for civil liberties, it seems likely that economic and ecological systems are too complex to be managed in this way by human institutions.

However, a key element of the concept is that the final benefit of all economic activity is *service* ie *"the satisfaction experienced when wants are satisfied"*. This is the essence of the 'end-user approach' which seeks to identify and meet consumer demands through providing more sustainable goods and services. This issue is discussed in more detail in *Section 2.6.2: The Utilisation-Focused Economy*.

4.3 *ENVIRONMENTAL UTILISATION SPACE (ECOSPACE)*

Environmental utilisation involves the use of resources from and discharge of wastes into the environment. The environment responds by regenerating (renewable) resources and absorbing wastes: this capacity is the available 'space', the boundaries of which are determined by the patterns and levels of economic activity (utilisation). As environmental degradation increases, reducing regenerative and absorptive capacity, the environmental utilisation space decreases.

Environmental utilisation space (also known as EUS or ecospace) is described by Hans Opschoor, one of the foremost thinkers on the subject, as a metaphor to capture the notion of limits and the need for redistribution of access to resources. Academic researchers and NGOs have developed the concept very much with a view to developing thinking on sustainable consumption. A key objective in the development of ecospace has been to extend the notion of carrying capacity by using human economic activities (not population) as the measure of critical loads and, particularly, by linking regenerative and waste absorptive processes to one another in order to demonstrate environmental/economic interlinkages.

Environmental utilisation space refines the concept of carrying capacity in other respects:

- It is a dynamic concept; societies can exist at different intensities of environmental utilisation. They can live beyond their ecospace by accepting environmental degradation (but this will reduce the ecospace available to future generations unless the damage can be repaired), and they can expand their ecospace through efficient technologies and restructured production/consumption patterns.

- It is not purely science based. The concept favours 'strong' sustainability (preservation of renewable stocks at levels sufficient to sustain income; quality of regenerative systems maintained at beyond minimum safe standards). However, it accepts that societies must determine their own feasible level of environmental utilisation which, while it must not undermine life support functions, may be less than optimal environmentally (eg acceptance of some species loss).

- It relates environmental limits to the energy and material **demands** of economic processes (who needs, produces and consumes what). The limits can be effectively expanded where new technologies/behaviour patterns enable more economic value or utility to be derived from given

environmental inputs with less pollution and waste. The implication is that economic growth *per se* is not constrained by national or global ecospace.

Table 2.3a Environmental Utilisation Space (Ecospace)

Characteristic	Comment
Intellectual Origin	The term EUS was first used by Horst Siebert in 1982 [10]. The concept has been applied to sustainable development and developed in some detail by Opschoor et al [11], with particular emphasis on understanding the dynamic interaction between physical limits and human demands on the environment. The ecospace concept has been adopted with enthusiasm by NGOs, notably Friends of the Earth, who see it as a basis for achieving more equitable distribution of access to global environmental services (use of resources and the 'right to pollute').
Key Factors	Quantitative limits (carrying capacity and critical loads) set on the basis of scientific analysis and political evaluation of the risks associated with exceeding such limits. Some analysts add a distributional element, and try to allocate established ecospace at a national, regional or per capita level (global 'fair shares').
Underlying Assumptions	A complete picture of limits to growth can never be known and, in any case, limits will be subject to constant change. Determining ecospace and related policy objectives, will be a continuous, political process. Greater global equity is necessary for sustainability. The current example set by the affluent North creates an irresistible political/social demand in developing countries to achieve, not simply an equivalent level of comfort, but the same lifestyle
Linkage with Sustainable Development	EUS is defined by the interaction of environmental services (sources and sinks) and human activities, unlike carrying capacity, it has no meaning as a purely biophysical concept. The concept therefore lends itself to development as a politically pragmatic tool for thinking about sustainable development Ecospace highlights the interlinkages between human demands and impacts on environmental services. For example, industrial pollution of the North Sea affects the fertility of fish, therefore fishing quotas need to take account of industrial activity. Trade-offs between environmental costs and economic benefits are thus made more explicit. On the issue of equity, ecospace provides a rationale for dividing (hypothetical) rights to consume and pollute. Division on a per capita basis is not assumed to be a wholly workable goal but it provides (a) a yardstick for broad assessment of current inequities and (b) a starting point for allocation of rights in any future extension of marketable rights (eg tradeable permits) to global commons
Measures/indicators	Measures of environmental utilisation space must somehow incorporate its dynamic element - the fact that human demands and impacts on the environment change over time. A measure suggested by Musters et al [12] is that of 'functional unit' which measures the size of a resource, modified according to the (competing) demands made on it and the quality required accordingly. Environmental performance indicators based on EUS are under development [13].
Measures/indicators (cont'd)	Friends of the Earth Europe chose to calculate Europe's EUS not according to resource availability but on the basis of environmental impacts of resource use. They propose a set of indicators based on key resource input levels (which take account of both resource depletion and pollution levels).
Economic Implications (eg wealth, production/ consumption patterns, competitiveness, employment)	Opschoor proposes a flexible ecospace, determined by science and value judgements, which allows for economic growth subject to a precautionary approach to environmental exploitation. Friends of the Earth interpret ecospace as a more physical ceiling to economic growth and suggest a non-growth economy managed within defined matter-energy throughput limits. Certain sectors of the economy may continue to grow if others shrink correspondingly. However, FoE emphasise the potential for maintaining comfortable lifestyles within these limits. Alongside technological change (see below) FoE propose a 'new model of wealth' that redefines well-being in less product and service oriented ways FoE see wealth distribution is a critical factor; the North must accept a much reduced ecospace in order that the South can achieve acceptable standards of socio-economic development. FoE propose that overall consumption levels in the presently industrialised world should be reduced by a factor of 10. (See also *Table 2.6a* and endnote [35]).
Trade and Development	The ecospace concept presents no serious objections to international trade in principle. Global 'fair shares' implies that more ecospace (resource and sink capacity) will be made available for use in developing countries, rather than being exported to the rich North.
Technology	Technology is key to allowing continued economic growth (Opschour) by expanding the available ecospace. It is also critical in FoE's scenario of a sustainable Europe. Increased resource efficiency, reduced material input, optimised products, new eco-efficient services are proposed in order to achieve their target input reductions.

Characteristic	Comment
Appropriate Scale of Action	The appropriate scale is largely a function of time. Global calculations of ecospace and agreement on global fair shares would be a continuing process into the foreseeable future. The concept arguably could have more immediate application at regional or local level. The global equity element might be downplayed but national calculations of ecospace could provide useful guidance in deciding between development options (for example, more energy consumption v more land lost)
Proposed Policy Approaches	An explicit attempt to build a policy approach around ecospace has been made by Friends of the Earth (FoE), in their scenarios for a 'sustainable Netherlands' (14) and 'sustainable Europe' (15). FoE calculated the ecospace of the Netherlands and of Europe by estimating global or continental environmental resources and services and 'sharing' them globally on an equal per capita basis. If calculated national ecospace is regarded as a national 'budget', the political process then becomes one of determining 'how much the nation can spend' and policy objectives should be framed in terms of inputs
Proposed Policy Approaches (cont'd)	This approach represents a departure from traditional environmental policy which tends to focus on outputs ie pollution levels. The FoE studies suggested input reduction targets for energy and key raw materials. Input targets, FoE argue, offer the possibility of controlling resource use, limiting pollution and stimulating efficiency. They also provide a measure of the 'sustainability gap' ie the difference between our present input (consumption) levels and sustainable levels. FoE regards ecological tax reform as crucial. Tradeable permits are viewed by both Opschoor and FoE as a key mechanism for making input targets and quotas operational.

4.3.1 *The Scope for Government Action*

Environmental utilisation space has generated intense interest among NGOs; 29 national Friends of the Earth organisations are participating in a joint programme to develop concrete proposals for sustainability based on the concept. Interest at government level appears to be largely confined to the Netherlands, encouraged perhaps by the country's highly visible environmental pressures, the intellectual framework of the NEPP, and a cultural tradition of shared responsibility.

Ecospace, as defined by Opschoor, offers an ethical point of departure and a framework for policy making, which explicitly addresses the need for scientific measurement, subjective judgements on risk and uncertainty and political dialogue on 'fair shares'. Risk assessment is envisaged as playing a major role in decisions on how much ecospace to utilise. Since attitudes to risk become more stringent with increasing wealth, disputes between North and South on the physical boundaries of development are to be expected. Opschoor foresees a long political process in which risks and standards are constantly redrawn, with a gradual convergence between countries (in the manner that standards regarding social and labour conditions are still converging).

Critics of distributional interpretations of ecospace argue that the calculation of global 'fair shares' is an unnecessary complication. International agreements on distributional issues are negotiated in a complex web of political and economic clout, existing rights of use (grandfathering) and current understanding of technical feasibility, costs and perceived risks. However, it is fair to say that current international debate regarding, for example, national 'rights' to emit

carbon dioxide or to use the genetic resources of tropical rainforests, represent precisely the blend of science and political negotiation described above.

A disadvantage of ecospace, especially as espoused by FoE, is that 'living within the ecospace' has overtones of rationing; a difficult message to sell where most consumers/producers do not recognise resource scarcity (eg oil) and/or the link between consumption and ecological damage is not immediately apparent (eg species loss).

4.4 ECOLOGICAL FOOTPRINTS AND ECOLOGICAL RUCKSACKS

The concepts of ecological footprints and ecological rucksacks have been developed in an attempt to estimate the environmental capital requirements of an economy, based on an interpretation of carrying capacity that takes into account the impacts of technological advance and trade.

The concept of ecological footprints redefines carrying capacity as the *area of productive land and water* required to support a defined economy or population at a specified standard of living, *wherever that land may be located.* In the context of industrialised economies, thriving on imported energy, materials, food and animal feedstocks, a large part of their ecological footprint is remote ie felt in other countries. As population numbers, and/or standards of living in rich countries increase, the remote land area required to support their economies rises. This phenomenon is described as 'appropriated carrying capacity'.

Ecological rucksacks are concerned with the *total weight of material flows* involved in the production of a particular good. Thus, the real ecological weight of eg a motor car includes the weight of its constituent materials (metals, glass, plastic etc) plus the weight of soil, rock and wastes removed or created during the extraction and processing of those materials. The materials extraction phase often occurs outside the consuming country; ecological rucksacks, like footprints, are concerned with displaced environmental impacts.

Urbanisation, technology and global trade have enabled rich communities to expand far beyond their local carrying capacities. In a well-known study of environmental footprints, Rees indicates that the Vancouver-Lower Fraser Valley region of Canada 'appropriates' the ecological production (food, timber, energy etc) of an area 22 times larger than the valley itself. At national level, another study by the same author suggests that the people of the Netherlands require a land area 14 times larger than their country to support their current consumption levels of food, wood and energy [16]. Researchers working on environmental rucksacks at the Wuppertal Institute have estimated that more

than half the material flows induced by the German economy occur outside the country's borders [17].

Some analysts argue that the industrial rise of developed countries was achieved through exploitation of the natural resources in the developing world and that this 'accumulated ecological footprint' amounts to an *ecological debt* owed by the rich to the poor [18].

While the environmental footprint concept is principally concerned with the psychological distancing and environmentally damaging effects of trade, ecological rucksacks take a more technical standpoint, focusing on the need to monitor and reduce the volume of material flows by means of eco-efficient measures (particularly dematerialisation and materials reuse) and lifestyle change.

Table 2.4a Ecological Footprints (EF) and Ecological Rucksacks (ER)

Characteristic	Comment
Intellectual Origin	The ecological footprint concept is most associated with work by William Rees of the University of British Columbia. The ecological rucksacks idea has been developed by researchers at the Wuppertal Institute in Germany. Both concepts' emphasis on fair distribution of production owe something to the anti-trade and self sufficiency ideals of Distributism [19]
Key Factors	Ecological footprints and rucksacks are measures of consumption that reflect a population's level of affluence and technological development. As wealth and consumption power increase, the area of productive land (EF) and throughput of material (ER) required to support every individual rise
Underlying Assumptions	Industrial economies currently survive through importing the 'surplus' carrying capacity of developing countries. This pattern of consumption activity implies a) that developing countries are restricted in their own development (insufficient carrying capacity available) and b) that developing countries' desire to emulate western living standards cannot be fulfilled since there is insufficient global carrying capacity: the Northern footprint already covers the earth A key assumption in both concepts is that technology and trade do not expand the earth's carrying capacity in the long term, only displace the effects of increased consumption levels.
Linkage with Sustainable Development	EF is essentially a static concept, seeking to stabilise net global consumption within total aggregate production levels, calculated on the basis of current input-output ratios. ER is more concerned with 'ecological modernisation' to reduce material flows. EF goes beyond a bio-physical rationale and emphasises the moral and ethical consequences of conventional development patterns. By focusing on the 'appropriation' of global carrying capacity by the rich countries, the concept seeks to force rich consumers to confront the distant economic, ecological and social consequences of their consumption levels and to highlight the need for international agreement on sharing the earth's capacity more equally
Measures/ Indicators	The EF comprises a population's demand for domestic food, forest products and fossil energy consumption, converted into the required area of eco-productive (agricultural and forested) land. Rees contrasts the global total of eco-productive land available per capita (declining with rising population from 5 to 1.7 ha between 1900 and 1990) with the per capita land demand (appropriation) of rich countries (rising from 1 to 4.6 ha over the same period). The EF thus provides an area-based indicator of the physical limits to material growth. The difference between global per capita land available and a population's actual land demand is that population's 'sustainability gap'. A key indicator used in ER analysis is Total Material Consumption (TMC) per capita (per capita material flows caused by economic activities of a given region, within and beyond that region). The ecological rucksack itself is calculated with Material Input per Service Unit (MIPS), an indicator based on the (input) material flow related aspect of sustainable development, modified by the number of utilisations (services) provided. High longevity or reuse thus reduces materials intensity.

Characteristic	Comment
Economic Implications (eg wealth, production/ consumption patterns, competitiveness, employment)	Rees argues that appropriation of carrying capacity is the root cause of extreme poverty, social instability and environmental degradation in much of the developing world. Production of 'luxury' export crops in poorer countries encourages rural displacement, social dislocation, urbanisation and unsustainable cultivation of marginal lands. Ecological decline, desertification, deforestation and the poverty and public health problems of megacities in the developing world are seen as the result of exploitation by the rich: *"Colonial rule, with its direct appropriation of extra-territorial carrying capacity may have ended, but many of the same resource flows continue today in the form of commercial trade".* (20) The assumption behind this argument is that shrinking the North's ecological footprint would permit the developing world to utilise its resources more efficiently, to the benefit of local populations. The short to medium term implications of dramatically falling Northern demand for Southern products are not pursued. Arguments promoting ecological rucksacks appear more concerned with reducing resource inefficiencies and reorienting economic activity to less material intensive ends.
Trade and Development	Rees argues that the dependencies created by international trade are likely to aggravate geopolitical tensions caused by resource depletion and environmental degradation. Existing trading relationships cannot be stable in an era of global change. Where inter-dependency is likely to threaten security, we should pursue 'bio-regionalism', a policy comprising regional economic diversity, independence and self-reliance. Trade should be restricted to the exchange of true ecological surpluses.
Technology	Technology is held to increase efficiency of resource use but not carrying capacity. While increased efficiency enables a defined environment to support either increased population numbers or increased material standards of living (but not both), total load still cannot exceed environmental limits. Increased technological sophistication is therefore not seen as a solution to appropriated carrying capacity.
Appropriate Scale of Action	As an analytical tool EF can be used as a measure at community, regional or national level, in order to estimate imported carrying capacity and the gap between actual and 'sustainable' consumption levels, based on per capita land demand and global per capita land available. In practice, ER may provide a starting point for international debate/negotiations relating to the distribution of global resources (for example, joint implementation agreements for CO_2 emission reductions are based - loosely - on the idea of industrialised countries paying for the right to use less developed countries' share of the earth's capacity as a CO_2 sink)
Proposed Policy Approaches	By implication, EF supports equity-oriented measures such as debt relief, technology transfer and development rights. It also implies the need for internalisation of environmental costs in resource pricing. Policy approaches to reducing/transforming trade flows are not proposed. ER promotes 'ecological modernisation' to reduce inputs of primary resources in industrialised economies. Strategies include increased efficiency, green design, increased use of services, intensive recycling and price reform to raise the price of raw materials.

4.4.1 The Scope for Government Action

Like the steady state economy, the concept of ecological footprints provides a strong moral context for the ecological limits to growth thesis. Where Daly is concerned with the need for generalised 'moral growth' in society, Rees focuses more specifically on the unjust distributional aspects of current consumption patterns. EF runs counter to important current assumptions about economic development, holding that free trade is, on balance, a 'bad' which works against the interests of developing countries. The concept's moral force also depends on acceptance of the idea that Northern markets are a neo-colonial trap for Southern exporters; sustainable development through environmentally responsible trade is not seen as a realistic option.

Given this starting point, implementation at government level is problematic. There would seem to be two entry points for policy makers interested in the concept:

- EF as an analytical tool to help assess, for example, the 'sustainability' of trade in particular goods or services (especially imports of scarce resources and exports of hazardous wastes). At a more strategic level, EF analysis could, for example, highlight a country's dependence on ecologically threatened imports (and consequent exposure to instability of supply).

- EF as an element in environmental foreign policy. The concept could influence aid and trade agreements or help to inform future international debates on eg tradeable permits or joint implementation schemes. The notion of EF had some influence in the 'sustainable trade agreements' signed by the Netherlands and a number of developing countries [21].

The ecological rucksack has also been developed as a means of highlighting and quantifying 'unsustainable' levels of consumption by (largely) Northern consumers. Like EF, the concept has potential as a moral framework for debate and a possible analytical tool.

Two problems should be mentioned in relation to policy development and implementation based on these concepts.

- Striking a balance between the current trend towards trade liberalisation and restrictions aimed at more sustainable consumption patterns will be immensely complex. The Uruguay round of the GATT negotiations tended towards the removal of restrictions on 'unsustainable' trade in eg tropical timber. GATT argued that environmentally motivated restrictions on trade could become a protectionist device used by industrialised countries against each other and, particularly, against developing nations. This argument is largely supported by lower income countries who (perhaps ironically) are likely to ally with their Northern trading partners to oppose sustainable consumption policies which would affect current trade flows.

- The very basis of the notion of 'over-consumption' in developed countries requires more careful analysis. It is rooted in some high visibility examples of conspicuous consumption and Northern concern and guilt over the plight of millions in the developing world. However:

    - many quoted examples of Northern extravagance (for example, Canadian energy consumption) have little direct link with environmental degradation or social well-being in poorer countries;

- analysis of consumer expenditure in rich countries demonstrates that the cost of meeting core needs (housing, food, health care, education etc) has risen in real terms over recent decades. Rising income and expenditure has thus become a necessity to meet these needs. Only the top quintile of the US population, for example, appears to have scope for reducing 'over-consumption' of non-essentials [22].

It may be argued that consumer behaviour relating to core need expenditure such as food has become more environmentally damaging in some ways, for example, more exotic foods are imported by air than was the case ten years ago. However, this should not automatically be characterised as 'excessive' or 'luxury' consumption.

It follows that, for most of the population of rich countries, 'unsustainable consumption patterns' are more a function of socio-economic structure (eg property prices/distance between home and work/need for second car) and a restricted choice of environmentally benign products than of the 'material cravings...search for reward...self-elevation' attacked by many environmentalists [23].

4.5 *NATURAL RESOURCE ACCOUNTING*

For nearly thirty years, countries have been calculating their national income according to guidelines, issued by the United Nations Statistical Office in 1968, generally known as the System of National Accounts (SNA). Gross Domestic Product (GDP), the measure of monetary transactions in an economy over a given period, is usually regarded as the key aggregate and indicator of national wealth for comparative purposes.

Environmental economists have long believed that the UN guidelines suffer from a number of critical shortcomings:

- they do not take account of the impacts of natural resource depletion and environmental degradation on the economic wellbeing of the population or future generations;
- they regard much anti-pollution expenditure ('defensive expenditure') as final consumption which counts towards national income;
- they regard natural resources as free goods;
- they fail to distinguish between value added by factors of production and sale of natural assets.

In response to these perceived failures, new approaches to measuring and valuing national performance and environmental quality have been actively researched and developed in recent years. These approaches stress the interlinkages between human activities and environmental outcomes, and attempt to integrate economic, environmental and, sometimes, social considerations.

Natural resource accounts are seen as a means of demonstrating linkages between the environment and the economy and for modifying national accounts to overcome the weaknesses listed above. They are collections of environmental and natural resource data in an accounting framework. Data are organised in the form of stocks and flows, or as inputs and outputs in order to produce a materials balance: for example, in their simplest form, a resource account for a mineral deposit would include the stock (ie total reserves), at the beginning and end of the year, and would account for changes during the year due to resource extraction, new discoveries etc.

Green GDP/Welfare indices are being developed in response to the perceived inadequacy of traditional GDP as a measure of national wealth or social well-being and its distorting effect on our concept of progress. Key alternative indices are described in *Table 2.5a*.

Indicators are parameters, or values derived from parameters, which provide information about an issue/area with a significance that extends beyond the properties directly associated with the parameter. They reduce the number of measurements required to provide an 'exact' picture of a situation and provide, instead, highly concentrated or aggregated information, the significance of which can be readily grasped. Indicators therefore simplify the process by which scientific/economic data is provided to decision makers or the public. Environmental indicators have been developed by a number of countries and organisations (notably the OECD, see *Box 2.5a*) with the aims of:

- reporting on environmental quality and trends;
- integrating environmental concerns in sectoral policies;
- measuring environmental performance at national and international level.

A key element to note in relation to natural resource accounting, 'green' economic indices and indicators is their potential to reshape the assumptions and objectives of economic behaviour. What we choose to measure largely shapes what we strive to achieve. Thus, an economy that measured its performance on the basis of the Human Development Index (HDI) would, in time, adopt a different perception of what constitutes social and economic development. This in turn would begin to affect investment priorities and lifestyle choices.

Table 2.5a Green Accounting/Green GDP

Characteristic	Comment
Intellectual Origin	Pearce [24] traces efforts to take account of environmental issues in accounting systems back to Nordhaus and Tobin (1972) in the United States, who attempted to incorporate environmental considerations into existing national accounts [25], and the establishment of the Department of Natural Resources by the Norwegian Government (1974) which developed a separate physical accounting framework to track natural and environmental resources.
Key Factors	Green accounting systems are intended to provide a consistent and comparable data set relating to the availability and use of natural and environmental resources. Such information enables policy makers to understand more completely the implications of economic decision making for the national wealth base. Green GDP measures are a quantitative indicator of national performance which attempt to incorporate qualitative judgements as to what constitutes welfare. Environmental indicators are intended to illustrate causal relationships between economic activities, environmental outcomes and change over time.
Underlying Assumptions	The failure of traditional accounting systems to reflect stress on the environment distorts decision making in government and business and sends misleading signals to actors about national 'growth' and 'welfare'. The dominance of the standard GDP measure of economic growth undermines all other efforts to shift towards more sustainable patterns of production and consumption.

Characteristic	Comment
Linkage with Sustainable Development	Because of their potential for measuring 'total' national wealth (ie economic, social and environmental well-being), natural resource accounts and green indicators have been promoted as practicable measures for progress towards sustainable development. For example, work in Canada is currently underway to develop indicators to measure the implementation of Agenda 21 in concrete terms [26]
Measures/ Indicators	The UN Development Programme's Human Development Reports explore the idea that there can be a substantial difference between economic and human development. Since 1990, the reports have presented a quality of life index as an alternative and corrective to conventional macro-economic indicators. The Human Development Index (HDI) establishes minimum and maximum (expected) levels for average longevity, education and standards of living and integrates these measures as a national 'score' between 1 and 10. Its principal application has been in developing countries, though a number of OECD countries have been assessed and received unexpectedly low international rankings. The Index of Sustainable Economic Welfare (ISEW) is based, like GNP, on a measure of personal consumption in the economy, but it takes into account a number of factors left out, including spending to offset social and environmental costs, longer term cost estimates of environmental damage and the depreciation of natural capital, net formation of man made capital, changes in the distribution of income and value for household labour. This index is internationally applicable and has already been applied by NGOs to a number of developed countries (for example, a UK version of the ISEW [27] highlights the difference between per capita GNP growth in the UK (2.3 times greater in 1990 than in 1950) and the ISEW (virtually no growth over the same period). The OECD has developed a core set of environmental indicators within a 'Pressure-State-Response' (PSR) framework. The PSR framework is based on the idea of causality: human activities exert *pressures* on the environment and change its *state* - the quality and the quantity of natural resources. Society *responds* to these changes through environmental, general economic and sectoral policies which form a feedback loop to human activities. Selected and/or aggregated indicators of environmental pressures, conditions, and societal responses are currently being used by the OECD as the basis for a series of Environmental Performance Reviews of OECD countries

4.5.1 The Scope for Government Action

There is a growing body of theory on natural resource accounting and a number of experimental uses, particularly in developing countries. However, there is widespread disagreement over the approaches that should be used.

Several projects sponsored by the World Resources Institute (WRI) and the World Bank have measured the **value** of natural resource depletion for resource dependent countries including Indonesia and Costa Rica. The main methodology used, that of Robert Repetto of the WRI, has been the subject of considerable criticism particularly from Salah El Sarafy of the World Bank who has advocated an alternative approach. The argument centres on the method used to place a monetary value on the resources extracted.

The valuation problem is more pronounced for the development of natural resource accounts in industrialised countries where the major environmental problems are related to pollution rather than resource depletion. Generally, there are no market prices for valuing these environmental losses and considerable uncertainty over whether valuations using other methods such as survey based techniques (eg willingness-to-pay) would be acceptable to national accountants. Developments remain very much at the level of theory.

An alternative and less ambitious approach has involved the development of natural resource accounts which have not tried to place monetary value on changes in stocks and flows. The **physical** approach develops accounts for

natural and environmental resources in a separate physical accounting framework. Non-monetarised natural resource accounts have been developed by governments including Norway, France and Canada and have met with some success as practical decision tools. For example, Norway uses a set of stock and flow accounts for energy resources and associated air pollution in combination with macro-economic models used for economic planning. These account-model combinations are used in policy analysis, for example, providing pollution forecasts associated with different levels of economic growth.

The Swedish Government has introduced the concept of *Environmental Debt* as a means of accounting for environmental problems in economic policy making. The environmental debt is defined as the cost of restoring environmental damage, where it is capable of being restored; it represents the environmental and economic burden passed from one generation to the next. In Sweden, the environmental debt has been estimated at nearly $US40 billion. It is part of the Swedish Government's economic policy that this debt must, at the least, not increase.

Substantial problems still remain regarding the means for valuing natural resource depletion and environmental damage. Until these difficulties, relating to acceptability and robustness of results, plus high costs of data collection, are resolved there is unlikely to be widespread acceptance of natural resource accounting methodologies or major impacts on decision makers.

4.6 *ECO-EFFICIENCY*

One proposed working definition of eco-efficiency is *"the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle, to a level at least in line with the Earth's estimated carrying capacity".* [28] Eco-efficiency is primarily a technical/managerial concept, concerned with maximising the productivity of energy and material inputs in order to reduce resource consumption and pollution/waste per unit output. Eco-efficiency appears to be interpreted at two levels:

- As a management tool to achieve pollution prevention, waste minimisation (the Total Environmental Quality Management agenda), and generate efficiency improvements, cost savings and competitive advantage. These dual objectives constitute the so-called 'win-win' development path. Proponents of this position believe that economic output may rise on the basis of constant or reduced resource inputs.

- As a means of achieving a more profound reorientation of the goals and assumptions that drive corporate activities, leading to changes in business culture, organisation and daily practices. This is the paradigm shift called for by environmental economists and many NGOs, and which underlies many of the concepts under review. Proponents of this position tend to believe that economic output should be held constant or decreased and that resource input levels should be dramatically reduced.

These interpretations are not mutually exclusive. The win-win development path is championed by companies with active environmental programmes (for example Dow Chemical and 3M) but is also supported by more radical reformers who see this form of eco-efficiency as a stepping stone to a non-growth, zero-emission economy. Eco-efficiency embraces a number of 'sub-concepts' or strategies which propose complementary - and overlapping - routes to increased resource productivity. They are listed in *Box 2.6a*.

Box 2.6a

Industrial ecology examines the material and energy flows through a facility or organisation and its interactions with natural ecosystems and other economic entities. The operational focus is on achieving 'closed loop systems' in which wastes from one part of the industrial system are reused or become raw materials for other parts.

Integrated Life-Cycle Management adopts a life cycle approach to products and processes, attempting to minimise their environmental impacts at every stage from "cradle to grave".

Reduced Energy Use is achieved through the use of less energy intensive materials, efficient processes, integrated energy systems etc.

Reduced Material Use (Dematerialisation) is achieved through miniaturisation, lightweighting, use of recycled materials and components and extended product life (via repair, component upgrade, reuse).

Green Design (Eco-design) adopts a life cycle approach to product design in order to develop products which are (more) energy and material efficient in manufacture and use, free of hazardous substances, durable, repairable, recyclable and capable of safe final disposal.

A major debate exists over whether eco-efficiency is enough to deliver genuine progress towards sustainable production and consumption patterns. Optimists cite the fact that technological advance and market forces have led to a steady decline in the energy/GNP ratio in developed countries. Past experience also indicates that industrialising countries are likely to stabilise at 'lower peaks' of energy demand than countries which industrialised earlier. Greater efficiencies are possible and business is already pushing in the right direction.

However, the task may be too great for technology and market forces to achieve. Ayres [29] calculates that, given the projected global increase in population and the increase in industrial GNP per capita required to alleviate poverty and environmental degradation in the developing world, industrial load per unit GDP will need to decrease by about 80 per cent by 2050 to achieve any reduction on today's environmental burden. The ecospace calculations of FoE Europe indicate that the EU countries should reduce their consumption of energy and non-renewables by 80-90% over a similar period.

Table 2.6a Eco-Efficiency

Characteristic	Comment
Intellectual Origin	The term eco-efficiency was coined by the Business Council for Sustainable Development (BCSD) in *Changing Course*, its report to the United Nations Conference on Environment and Development in Rio [30] The concept has been embraced by environmentalist groups who stress the ecological necessity of reduced throughput more than the economic benefits of efficiency.
Key Factors	A quantitative approach using input-output measures to determine the ecological efficiency of economic activities Stresses the output limitations to current production/consumption patterns (the environment as a sink for wastes) rather than resource scarcities.
Underlying Assumptions	Existing opportunities for energy and material efficiency gains are vast and should be exploited [31]. They represent the obvious 'first step' in moving towards sustainable production and consumption patterns (though attitude and behaviour changes will also be required). There is an applied assumption in some expert analysis that technical efficiency will automatically lead to reduced consumption and waste. The opposite may be the case since increased efficiency can reduce costs, encouraging expansion of capacity and/or generation of additional income and expenditure on more goods (the rebound effect). [32]
Linkage with Sustainable Development	Eco-efficiency offers one means of translating 'sustainability' goals into operational targets For example, the Dutch Advisory Council for Research on Nature and the Environment (RMNO) has estimated key reductions in resource use and polluting emissions required by 2040 if the global economy is to stay within the earth's (currently estimated) ecospace. [33] These reductions have been estimated as equivalent to production efficiency improvements of between five and fifty times, or an average 20-fold improvement on 1990 levels. [34]
Measures/ Indicators	Global level eco-efficiency targets have been proposed, for example by the *Factor 10 Club* [35] who suggest, over the next 50 years, a 50% reduction in global flows of non-renewable resources, achievable through a 10-fold increase in average resource productivity of (presently) industrialised countries. A national measure of eco-efficiency exists: energy intensity (energy consumption per unit GNP). Materials intensity (and tracking) measures are highly recommended (eg by Ayres) but current mass balance data are not adequate for the purpose. Some progress is being made with establishing eco-efficiency targets, measures and indicators at organisation and plant level.

Characteristic	Comment
Economic implications (eg wealth, production/ consumption patterns, competitiveness, employment)	Eco efficiency, as promoted by its business advocates, offers the best chance of maintaining economic growth and competitiveness while achieving improved environmental quality. Arguments include: • pollution prevention can save money through avoiding waste disposal costs and end-of-pipe remediation; • acting voluntarily can minimise future risks and possible environmental liabilities; • moving ahead of the field can bring competitive advantage; • 'green' products can increase a company's consumer appeal and open new markets; • a 'green' image is good for corporate morale and recruitment. Many environmental economists argue that, despite significant energy/waste efficiency improvements in recent decades, agricultural, industrial and consumer activity is still almost entirely dependent on fossil fuel consumption and on dissipative use of toxic chemicals and heavy metals. This pattern is clearly incompatible with long term sustainability. In addition, Ayres, for example, argues that a politically feasible win-win development path would have to involve very few or no losers and that each incremental socio-economic change must leave every interested party better off - or at least no worse off. To date, serious attempts to reverse some of the 'wrong trends' (eg energy taxes) have been resisted on the grounds that continued growth and prosperity absolutely depend on the continuation of current patterns of energy supply. His conclusion is that the win-win path development trajectory (no pain) may not exist [36]
Trade and Development	Achievement of eco-efficient economies in the North would have major implications including: • probable establishment of product criteria relating to constituent materials and energy consumption in production and use. These could constitute a trade barrier; • stable or reduced level of demand in the North for commodities and finished goods; • an increase in the 'wealth gap' if significant economic activity is transferred from processing/manufacture of materials/products (exported from the South) to recycling/repair of materials and products (within closed loop Northern economies). Efficiency considerations are likely to militate against repair/recycling of exported products in their country of origin.
Technology	Key elements in eco-efficient technologies include: • energy and materials efficiency throughout process and product life cycle. Encompasses reduced volume and toxicity of materials, energy saving, product quality; • shift from linear to circular production/consumption systems (closing the loop); • (longer-term) shift from fossil to renewable energy technologies. A recent major study [37] has concluded that we must recognise limitations to even the most innovative technologies. Improving eco-efficiency might not halt degradation of some key renewable resources eg topsoil, biodiversity, clean air and water (the non-substitutables), and might exacerbate world-wide inequities and human suffering (if the North maintains its economic and technical dominance)
Appropriate Scale of Action	Indicators and macro-measures will be most useful at national and global level. Measurable actions are already being started by national and local government, enterprise and households (eg the Global Action Plan initiative).
Proposed Policy Approaches	Approaches recommended include price reform (shifting tax burden towards pollution and resource use; internalising externalities), energy transition (fossil fuels to renewables) demand side management (especially through supply of function by services in place of products), regulatory frameworks (eg extended producer responsibility, recycling targets) efficiency standards, accounting innovation (new measures of industry/national performance) and information (technology sharing, product labelling). The technology forcing role of substance bans/phase-out requirements should not be overlooked, though the transition costs can be high (see *Section 3.5.1* and note).

4.6.1 The Scope for Government Action

The scale of efficiency improvements called for by eg Friends of the Earth and the Factor 10 Club are unlikely to be willingly undertaken by most governments. (Though Weizsäcker [38] points out that, for example,

quadrupling energy productivity could be achieved by a three per cent annual productivity increase sustained over 45 years).

Politically, eco-efficiency has a number of shorter-term attractions. Clean technology is regarded as a central plank in achieving the 'double dividend' of economic growth and improved environmental performance [39]. The experience of Germany and Japan is often quoted as evidence of the export earnings potential when companies take a lead in developing clean technologies. Not least, most policy makers are sensitive to the dangers of promoting sustainable development as a social goal involving reduced levels of consumption and, by implication, standards of living. Eco-efficiency, at least in the short term, offers the possibility of pursuing environmental objectives while maintaining or improving people's quality of life by delivering quality products, improved services and a cleaner environment.

Government initiatives to improve energy and materials efficiency are numerous (significant examples being the Swedish Ecocycle Bill, the German Closed Cycle Economy Law, the Japanese Basic Environmental Plan and the Dutch energy efficiency covenants with industry sectors). Many large companies have also embarked on efficiency and waste reduction programmes [40].

It would seem that a firm basis exists for further development of the eco-efficiency concept at policy and operational level.

Against this, clean technologies and technology transfer have been advocated for many years by environment and development agencies, to relatively little effect. Three decades of technical environmental policy have focused on pollution abatement and clean up, where a market has been created by legislative requirements. Policies aimed at fostering and diffusing eco-efficient technologies are still relatively new. Policy makers have addressed themselves to:

- identifying promising technologies (information exchange);
- stimulating appropriate R&D (subsidies, research grants);
- encouraging industry to implement change (environmental management certification schemes, BAT requirements, tax incentives);
- encouraging public demand for change (eco-labelling, reporting requirements on industry).

Government's ability to influence investment in new technologies must be limited, given that state spending on R&D in the OECD countries represents only about 5% of the total. It may be the case that government efforts should focus not on technologies themselves but on creating market conditions in which

investment in clean technologies is perceived as a requirement, rather than an option, for competitive industrial performance.

4.6.2 *The Utilisation-Focused Economy*

A concept or strategy closely related to eco-efficiency, which appears to be increasingly proposed at academic level, involves encouraging economic development based on maximising the service obtained from each unit of resource. The utilisation-focused economy stresses:

- more intensive use of more durable products; and
- greater reliance on service in place of products.

The strategy is treated at some length here, due to its particular relevance to end-use consumption patterns.

Resource-saving strategies in OECD countries are currently focused on the **production** and **disposal** phases of product life:

- clean production policies focus on eg energy saving, clean process technologies, waste reduction or reuse):

- disposal policies include secondary recycling of materials, landfill controls/bans, producer take back requirements etc.

However, the **utilisation** phase of product life ie a product's properties and performance in use has traditionally received less attention. This is now changing with the introduction of ideas proposed in a utilisation based economy. They include eco-design (design for long-life, reusable or repairable products), product life extension schemes (repair and maintenance, updating technology, upgrading quality) and more intensive use of goods and systems (eg via leasing and hiring services). This area of product policy is now the subject of policy attention, especially in the Netherlands, Germany, Norway and Sweden.

The *replacement* of products by services which perform the same function (eg widespread use of 'mobility' services instead of car ownership, use of laundry services instead of washing machine ownership) is currently beset by infrastructural, pricing and perceptual problems involved in making the transition.

The utilisation-focused economy appears to offer significant potential advantages over the manufacturing-focused economy. Stahel [41] argues that:

- Reuse of products results in a slowdown of materials flow through the production cycle. This is not the case with materials recycling which

closes loops but does not always reduce demand for virgin materials since it tends to result in a degradation of the use value of the material recycled.

- Product life extension involves, in many cases, a substitution of labour for energy. Small, localised service workshops displace large globalised manufacturing and recycling loops. Product repair requires (skilled) labour and low energy input; materials recycling requires (largely unskilled) labour and high energy input.

Increased use of product life extension services therefore seems not only to offer environmental advantages but to be in accord with the social infrastructure and employment goals set out in the recent European Commission White Paper [42].

The transition towards more intensive product use and greater use of services would require both technological and competitive strategies. Technological adaptations include durable, low maintenance product design, standardisation of components and 'self-curing spares'. Of equal or greater importance are socio-economic strategies including training, information systems (enabling access to product design/repair systems), liability provisions (selling only the use of goods implies an unlimited product liability for the manufacturer and/or repairer) and reorientation of consumer perceptions.

4.6.3 The Scope for Government Action

The rise of service industries, relative to manufacturing, is already a clear trend in developed economies and can be expected to increase. Services, especially the financial, entertainment, tourism and leisure sectors, are an area which the North is likely to exploit in order to maintain competitiveness in the face of the manufacturing expertise and cost advantages of Asian economies. Fiscal policies to encourage the growth of these sectors are already well developed in many OECD countries (eg tax breaks accorded to the film industries in the US and France).

A notable trend is that some governments are now (indirectly) promoting the service sector as they scale down welfare provisions in the face of demographic change (ageing populations in many western countries will result in a shortfall between tax receipts from the working population and demands for spending on health care, sheltered housing etc). Changing employment patterns caused partly by deregulation (the decline in 'jobs for life') also play a role. Personal pension plans, private health care, private education fees and personal accident insurance are among the fastest growing areas of consumer expenditure in the

UK, with an observable decline in spending on some categories of durable goods [43].

4.7 *COMPARATIVE ANALYSIS OF KEY CONCEPTS*

The concepts under review are interlinked in many ways: most start from the premise that ecological limits exist to the earth's capacity to support human activities and that economic growth must be controlled in some way to stay within those limits. Consumption levels, to date, have risen in line with economic expansion; only eco-efficiency and (to a lesser extent) ecospace, pursue the idea of decoupling economic and consumption growth.

A significant point of divergence between the concepts lies in the prescriptiveness of what they are trying to achieve: concepts range along a spectrum from the elaborate vision of a steady state economy to the generalised shift of direction implied by the use of green accounting systems. *Table 2.7a* briefly compares the concepts, highlighting factors of relevance to policy making.

Table 2.7a ***Comparative Summary of Concepts: The Policy Perspective***

Characteristic	Carrying Capacity	Steady State Economy	Ecospace	Ecological Footprints/Rucksacks	Green GDP	Eco-Efficiency
Objective/Timescale	Human activities compatible with continuity of earth's life support functions. Time horizons depend on scientific understanding of each problem and political urgency of action	Non-growth economy in biophysical equilibrium. Open timeframe	Human activities compatible with life support systems. Some analysts derive from this the need for 'fair shares' access to ecospace	Global fair shares and bio-regionalism (EF) Reduced energy and material flows between and within economies (ER). Long term.	Short term: establishment of new measures and indicators. Long term: reorientation of social and economic goals	Short to medium term: win-win development path of economic growth and environmental quality (WBCSD). Long term: achievement of major reduction in energy/ material throughput (possibly limiting economic growth).
Political Feasibility (key actors, decision making processes, role of government)	High when environmental damage already in evidence. Uncertainty over critical thresholds implies actions implementable only via political debate	Global command and control approach. Role of government supreme	Requires strong government framework (to establish limits) and major lifestyle change (green consciousness)	Moral leadership role required of government. International trade agreements only existing forum for implementation	Government and business interest in indicators and performance measures a starting point for negotiation on new economic and social measures	Enterprises key to implementation. Some progress already with 'greening of industry', partnership initiatives between government/ industry/NGOs/local groups. Government key to setting incentive framework
Communication/ Appeal	Scarcity scares somewhat discredited; public and business more receptive to idea of 'pollution overload'	Abstract concept of great intellectual interest but little popular appeal.	Strong potential appeal to environmentally active, socially conscious. As currently 'popularised', the overtones of rationing may be offputting to mass consumers	As ecospace	Potentially high. Growing public awareness that environment 'undervalued' and growth not delivering well-being (loss of 'feel good factor')	Potential appeal to both business (profit and social approval) and public (tax shift, new employment opportunities)
Operationalising Principles/ Instruments	Precautionary principle. Risk assessment, critical load analyses, emission/ discharge limits, substance bans and controls	Equilibrium and greater equity. Centralised institutions for global management of population, wealth and resource use	Equity. Creation of markets, quotas, input limits (FoE) tradeable permits (FoE and Opschoor). Lifestyle change	Equity (EF and ER) Material flow accounts, eco-efficient technologies, lifestyle change (ER) Reform of aid and trade regimes (EF)	'Real cost' accounting. Internalisation of externalities, new indicators, pursuit of (qualitative) economic development not (quantitative) growth	Increased resource productivity. Economic instruments, BAT, standards, targets, substance controls, consumer information
Key Economic/ Technological Considerations	Decisions currently governed by economic/social/ technical feasibility of alternatives to present activities	Non-growth economy, minimum throughput technologies.	Eco-efficient technologies in non-growth economy (FoE) Eco-efficiency might permit growth (Opschoor)	Northern economies are in a state of "over-consumption". Eco-efficiency (dematerialisation) key to change	Economic "growth" is a false goal, increasingly divorced from human welfare.	Improved resource efficiency key to environmentally sustainable economic growth
Trade Implications	None specific. International commitments (eg on emission targets) may have growing impact on trade in clean technologies and intellectual property rights	Discourages trade above minimum necessary for 'sufficient' (maintenance) living standards.	Implies changes in trade flows but nature of change uncertain	Trade reduced to true 'ecological surpluses' (EF) Dematerialisation implies reduced flow of raw materials to industrialised countries (ER)	Revaluation of traded materials (eg tropical hardwoods) would create both trade barriers and opportunities	Slowed or declining demand for energy/ materials would impact exporters. Efficient technologies would generate new export markets. Probable North-South imbalance
Scope for Further Government Action	High, as scientific element of economic/ environmental/social trade-off decisions eg in international agreements.	Very limited.	Limited. Possible starting point for public debate; likely to feature as bargaining element in international negotiations	Very limited. But potentially valuable as a strategic analytical tool - degree of national dependence on imported environmental capital	High. Methodologies, indicators and institutions already exist and national accounting is the province of government	Medium-high. Government sets the ground rules by which business operates

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5 *SUSTAINABLE CONSUMPTION CONCEPTS AND POLICY IMPLICATIONS*

This section draws on the analyses developed in *Sections 1* and *2* in order to assess the potential utility of the concepts under review in developing and implementing future policies for sustainable production and consumption.

A practical framework for developing such policies may be defined by a number of key questions, outlined below. This section examines where and how the concepts might help to shape the answers. Where appropriate, it also draws on other work by researchers in the field of sustainable consumption.

5.1 WHAT IS 'UNSUSTAINABLE CONSUMPTION'?

At present, no clear guidelines exist for determining what is "unsustainable". **Carrying capacity** is clearly a fundamental concept in assessing issues of resource exploitation (eg defined fishing stocks) or pollution (eg local acid deposition) but more is needed to answer the question **"does it really matter?"**.

Concepts with a stronger moral imperative (eg ecological footprints) can help define priorities over what we really care about but **value-based criteria will be difficult to agree** at global (or even national) level. Eco-space as defined by Opschoor is explicit in its acknowledgement that agreement on 'limits' and criteria for action must allow for input from a wider audience than policy makers. **Political debate and participatory mechanisms** are likely to required to make decisions on trade-offs that cannot be decided on technical or other expert grounds.

The limits-to-growth premise of all the concepts (with the exception of eco-efficiency) suggests that **ecological viability is the yardstick**: many environmental economists start from the presumption that key unsustainable trends relate not so much to eventual exhaustion of natural resources, many of which may be substitutable, but to the **continued accumulation of wastes in the environment** (whose impacts cannot be predicted or controlled).

Beyond this, the concepts offer little guidance on priorities, being more concerned with the delivery of a range of broad objectives. It would seem that **there is an urgent need to establish criteria** for determining which issues are critical to sustainability (which have the capacity to undermine our prospects of continued survival with a tolerable quality of life) and indicators to tell us whether we are moving in a more or less sustainable direction.

Relevant Ideas

Wetterings and Opschoor [44] suggest three dimensions of ecospace which help to set boundaries for decision making on what constitutes an acceptable level of impact on the environment: pollution of natural systems, depletion of renewable and non-renewable resources and loss of naturalness (integrity, diversity, absence of disturbance). They suggest a practical sustainability criterion for non-renewables:

- residual stocks must be kept at (or raised to) a level sufficient for use over a period of at least 50 years; consumption should be reduced to be compatible with this.

The problem of defining rigorous but usable criteria for decision making is being tackled as part of the *Sustainable US* project, currently underway at the World Resources Institute. A set of future states are being defined for key sectors of the US economy. These scenarios are broadly "more sustainable than the present" but near term ie achievable within existing political institutions and known technologies. The idea is to identify recurrent themes in the scenarios (eg concern for future generations) and from these, to identify the criteria that appear necessary to steering decision making in each of the economic sectors in the right direction. Examples are:

- irreversibility: on this basis climate change takes greater priority than eg traffic congestion which, however unpleasant, can be 'fixed';
- substitutability: which natural stocks are essential to human life and currently appear incapable of substitution?

5.2 *WHAT BROAD CHANGES ARE REQUIRED AND WHO NEEDS TO ACT?*

Two broad categories of change are identified by all the concepts:

- *Technical/infrastructural changes that lead to greatly increased energy and material efficiency and reduced use/emissions of hazardous substances.*

This is variously interpreted as (1) maintaining economic growth without increasing energy/material throughput (eco-efficiency) and (2) containing economic growth and reducing energy/material throughput while preserving quality of life through different consumption patterns (eg eco-space, service economy).

- *Social/institutional changes that constitute a 'paradigm shift' - a major reorientation of our beliefs, values and standard practices.*

The moral starting point is essential to some concepts, whether stemming from a desire for greater justice and equity (eco-space, ecological footprints) or a wider re-examination of what constitutes human welfare and 'right' behaviour (eg steady state economy).

From an ecological point of view we are all consumers. The concepts acknowledge this but place different stress on the roles of different actors:

- **Industry** is seen as the leader in achieving **eco-efficiency**. The concept is inherently attractive to business since its principles do not run counter to prevailing political or market doctrines. However, the obstacles presented by the need for new investment and management practices are formidable and government action to create the right incentive framework is also key.

- **Consumers** are the ultimate managers of economic activity and changes in individual behaviour and lifestyle choices are central to the objectives of the **steady state economy, ecospace, ecological footprints/rucksacks**. These concepts place great emphasis on government action to control consumer behaviour or reshape consumer demand; they also presuppose a kind of moral revolution in consumer culture.

- **Government** is assigned a key institutional role in establishing the mechanisms for **green accounting** (changing measuring systems) and **ecological footprints** (changing trade regimes). It has an all powerful distributive role in the **steady state economy**. Other concepts focus more modestly on the need for governments to introduce new legislation (eg stricter technical and quality standards) and fiscal reforms and to provide information to other actors. The role of government is discussed in more detail in *Section 3.4.*

5.3 *WHAT ARE THE POSSIBLE IMPLICATIONS OF "SUSTAINABLE CONSUMPTION"?*

The implications of stabilising, or reducing, energy and materials consumption in the North have not been fully analysed but scenarios proposed, or implied, by the concepts would seem to entail some or all of the following changes:

Globally...

- a stable or declining demand in the North for imports of industrial raw materials, agricultural commodities and some finished goods.

- the incorporation of energy/material efficiency standards, or 'conditions of production' standards, into international product standards. This might be voluntary (eg via eco-labelling schemes) or mandatory;

- an increased dependence on international institutions and procedures to secure agreement on actions (eg substance controls) and compensation (eg over distributional effects);

- increased use of monitoring and inspection agencies (both public and private sector) to validate product/service claims to sustainability.

- a further rise in the relative importance of the service sector in industrialised economies, leading to a requirement for different educational and training skills.

Nationally...

- significant changes in land use patterns to reduce energy inefficiencies in distribution and transportation;

- greatly increased use of financial instruments to guide purchasing and behavioural decisions by business and individuals. This would probably involve the extension of market mechanisms to novel and unpopular areas eg access to countryside and road space;

- increased importance of local economies and communities, which will provide their inhabitants with more of their material, employment, recreational and social needs than is currently the case (for example, in countries where increased mobility has led to the rise of 'dormitory towns' which lack many social facilities). This may have implications for the authority of central governments;

- an emphasis on high-cost, high-quality products (durable, repairable) at the expense of low-end, short-lived products. This will have consequences for lower income groups in society;

- a probable shift in employment patterns, with growth in the service sectors.

5.4 *POLICY STARTING POINTS: WHAT IS THE ROLE OF GOVERNMENT?*

Traditionally, government has acted to control pollution from economic activities via regulation and a system of economic incentives and penalties (for example user and waste disposal charges). This is accepted because the market does not always lead to the best environmental outcomes for society (there is market failure). It is now clear that achieving more sustainable consumption patterns will depend on both:

- the regulation of supply side processes (directly via standards and controls and indirectly via targets and economic incentives); and

- reshaping current patterns of demand, in particular, demands made by individual consumers.

A key question concerns the extent to which policy making should emphasise reshaping (managing) demand from the bottom up (eg using product information) or from the top down (eg by redrawing market 'ground rules' in a way that necessarily changes demand).

Those of the concepts based on redistribution of ecological assets (global fair shares) tend to blur this point, calling for a widespread culture change (bottom up) but placing great emphasis on policy makers distinguishing between basic human needs, which must be supplied, and 'luxury' consumption, which is 'unjustified'. Luxury consumption (defined by whom?) must, according to the authors of the concepts, be managed, for example, by redirecting human aspirations to non-material enjoyment (sustainable Europe as defined by FoE) or rationed (in a steady state economy). Such approaches are not currently to be found on the agendas of OECD countries.

Despite these difficulties, policy makers are expressing considerable interest in the 'end user' approach which applies the techniques of demand side management to consumption patterns [45]. The end user approach does not seek to distinguish between basic and luxury needs, or to re-channel material consumer aspirations in more spiritual directions. It does provide a useful basis for rethinking what consumers actually want when they buy a product. Often, consumers are purchasing *function*, for example warmth or hot water in the home, which can be supplied by other means than the *product* of electricity. Demand management in this area has been pursued with success by many US power utilities who are selling insulation and energy efficiency programmes instead of investing in new capacity: some Californian companies now expect to generate the bulk of their profits from demand side management schemes rather than increased electricity sales.

It remains the case that governments have very limited control over most of the important factors of change in modern society (population growth and distribution, cultural beliefs, values and aspirations; the pace of technological change; the workings of international markets). Nor have they much direct control over social and economic behaviour (investment and purchasing decisions, lifestyle choices). In addition, most governments would interpret the need for lifestyle change as a matter of individual responsibility which may be informed, but not coerced, by government initiatives.

Considerable debate therefore surrounds the efficiency - and legitimacy - of government intervention to reshape demand. One argument runs that it will be

simpler, and more effective, to apply the end user concept in reforming market parameters ie the rules under which enterprise supplies the customer. It is not necessary for government to target consumers directly because enterprise itself will 'market' sustainable goods and services if those are what it is required to produce.

The counter-argument is that instruments which specifically encourage individual actions and lifestyle change are necessary because they foster the climate of opinion in which more sweeping measures (such as energy taxes or abolition of subsidies) can be accepted.

5.5 *CONCEPTS AND POLICY IDEAS*

The concepts under review vary in the extent to which they are concerned with the realities of implementation. In general, they appear to favour government action in three broad policy areas: administrative and regulatory frameworks, pricing reform and opinion forming. This section analyses the extent to which the concepts offer new insights or indicate a clear direction for future policy development. Where relevant, international research projects helpful to thinking on sustainable consumption are also cited.

4.12.1 Administrative/Regulatory Frameworks

Most concepts agree on the importance of introducing **alternative national accounting systems and performance measures**. They are seen as key to reshaping economic goals and more fundamental perceptions of social well-being.

Regulatory regimes (emission/discharge limits, substance and process controls, standards and targets) are assumed to be an essential starting point of sustainable consumption policies. Concepts with a strong technical component stress the importance of government action to promote the development and dissemination of clean technologies, and to contain the problem of 'free rider' companies. A key difficulty relates to the relative lack of influence of government spending on technology R&D. This problem is not directly addressed by the concepts.

Bans and phase-out programmes for hazardous and toxic substance are much advocated by NGOs promoting sustainable consumption. For example, recent years have seen recurrent calls by Greenpeace for a ban on chlorine. Bans have a technology forcing role and demonstrate government and/or industry commitment to action and for this reason are favoured by Friends of the Earth in their policy approach to implementing the ideas of the ecospace concept.

However, the economic and social implications of sweeping bans are potentially serious and FoE acknowledge the need for prior evaluation in terms of economic costs, technical feasibility and the trade offs involved, for example between environmental protection and human health.

The **greening of government procurement policies** is urged in more politically oriented concepts (eg ecospace as promoted by FoE). Action in this area has been on the agenda for some years but there appears to be little recognition in the concepts of why it is difficult to put into practice. Many government departments, for example, are legally bound to lowest price bidders in many procurement areas, which may exclude environmentally beneficial suppliers. The missing element is political will: there are few signs that green procurement has genuine and unequivocal backing at the highest political level.

The need to **reform current trade regimes** is explicitly addressed by ecological footprints and implied in other concepts concerned with equity issues. However, these concepts do not engage with existing trade doctrines in the way that, for example, environmental economists have tackled the orthodoxies of neo-classical economics. The limited integration of environmental concerns into the GATT and NAFTA negotiations represents the summit of achievement to date. There would appear to be a need for greater dialogue in future and research to develop economically feasible theories for ecologically sustainable trade patterns.

4.12.2 Pricing Reform

Many concepts strongly advocate **ecological tax reform** ie a tax shift from labour to use of environmental resources and pollution. Numerous studies have tried to estimate the ecological and social/employment benefits that might result. 'Getting the prices right' has emerged as a core strategy of most industrialised countries' policy approach to correcting market failure. However, the OECD correctly notes that *"there is neither popular support nor national leadership to implement such pricing policies. Intermediary steps are needed"* [46].

A particular problem relates to the reluctance of finance ministries to risk financing government expenditures from an uncertain (and intentionally declining) revenue base. The primary purpose of taxation is seen as revenue raising, not behavioural change. Some proponents of ecospace and eco-efficiency have tackled this problem by suggesting a slow, incremental tax shift that would permit annual adjustments between resource prices, subsidies and labour taxes to maintain revenue neutrality [47].

The ecospace concept (FoE) suggests **creating markets and tradeable permit systems** for emissions, in combination with input reduction targets, as a means of controlling resource use.

Industrial Ecology and Pricing Reform

Industrial ecology involves tracking energy and material flows through a plant, region or national/global economy. The Environmental Futures Unit of the United States Environmental Protection Agency has extended this technique to financial flows associated with key resources such as energy and water. The Unit has prepared 'maps' illustrating, to scale, the size of energy flows (fuel type, end user, wastage) through the US economy, the size of Federal R&D funding (in different energy sub-sectors) and the size of Federal subsidies (to primary energy sources and end use sectors, including hidden subsidies in the form of externalities not borne by end users). The maps present a striking visual representation of eg the gap between expenditures on new technologies and nuclear power, and of areas of energy waste. They are intended to highlight key intervention points; areas where government action would have the greatest effect [48].

4.12.3 Opinion Forming

All the concepts agree (even the relatively 'technocratic' eco-efficiency) that achieving sustainable consumption will require a change in social culture - our values and aspirations - and look to government to stimulate its development. A key objection is that government agencies do not possess sufficient knowledge or moral authority to define this new paradigm; if they try, they will be competing for attention with many other opinion formers such as the advertising industry, the media, educational institutions and 'business cultures'. More modestly, the concepts urge much greater government effort to provide information to consumers (public and enterprise) on:

- the environmental impacts of their behaviour and product choices;
- the potential environmental (and social/economic where appropriate) benefits of alternative consumption patterns;
- examples of progress with government and independent actions already undertaken.

Considerable attention is paid by FoE in their vision of a sustainable Europe to the means by which people might be encouraged to shift to lower material consumption levels. Their report demonstrates a tension between, on the one hand, faith in the potential for **voluntary action**; some people will apparently welcome spiritual liberation from the tyranny of excessive dependence on material possessions and 'addictive buying'. On the other hand, there is recognition of the need for a more **coercive incentive framework**, mostly pricing, to generate real momentum.

Experience to date indicates that good environmental information, product information and provision of the necessary infrastructure, can induce behaviour change where financial, inconvenience and social costs are perceived to be low.

For example, high recycling rates have been achieved over recent years in many OECD countries. Behaviour changes involving high perceived costs, notably the use of public transport instead of private cars, are proving almost entirely resistant to opinion forming measures [49].

6 *CONCLUSIONS AND ISSUES FOR FURTHER CONSIDERATION*

Concepts are intellectual constructs which need translating into more operational mechanisms if they are to have any implementation value. They are essentially qualitative ideas, contributing to a vision of a desirable end point.

With this qualification, a number of useful conclusions and propositions may be drawn from the concepts reviewed in this paper.

- The changes required in our present consumption patterns involve orders of magnitude increases in the productivity of energy and material resources, reduced/eliminated use of toxics and creation of loop-closing systems. This is broadly the agenda of eco-efficiency.

- Economic instruments are believed to be key to implementation but there are ideological and practical obstacles to widespread adoption of eco-taxes.
- The importance of global cooperation is recognised but new 'supra-national' bodies may not be a realistic short-term option. International agreements have proved to be an instrument of (perhaps unexpected) effectiveness. The UN ECE Convention on Long Range Transboundary Air Pollution, the Rhine Action Plan, the Sofia and Montreal Protocols, have all delivered significant emission reductions.

- The implications for international trade of shifting to consumption patterns which involve reduced material flows in developed countries are potentially serious. In such a scenario, demand for many materials might stabilise or decline.

- Much current academic and NGO thinking on sustainable consumption is taking place in a closed world; it takes as a given the need for dramatic change in Northern levels and patterns of consumption. If this is correct, there is a need for greatly improved communication: in the 'outside world', the case for sustainable consumption in most areas has yet to be made.

- Sustainability measures proposed in the concepts (and implemented by governments to date) are still mostly in the form of constraints. 'Positive' measures are somewhat unclear, having to do with moral shifts in society. Historically, major social changes (comparable to the scale of change required to restructure Northern consumption patterns) have occurred in response to **perceived opportunities**. The post-war transformation of settlement patterns and social relations was a dramatic, unforeseen - but probably predictable - consequence of people enthusiastically purchasing motor cars. Current policy making devotes little effort to analysing social trends with a view to identifying 'revolutions in the making' and influencing their early development.

ENDNOTES

(1) United Nations Conference on Environment and Development, Agenda 21, Chapter 4.3.

(2) *World Resources 1994-95*, WRI, 1994.

(3) United Nations Development Programme, *Human Development Report 1992*, New York: Oxford University Press, 1992. Quoted in The Worldwatch Institute, *State of the World 1994*.

(4) The Worldwatch Institute, *State of the World 1994*, Earthscan Publications, London, 1994.

(5) The term 'North', as used in this paper, refers to both OECD countries and the richer sections of the industrialising world where high-consumption lifestyles are clearly emerging as a development model.

(6) *Summary of Issues Raised at the Symposium on Sustainable Consumption*, 19-20 January, 1994, Oslo, Norway

(7) Oslo Ministerial Roundtable Conference on Sustainable Production and Consumption, *Elements for an International Work Programme on Sustainable Production and Consumption*, February 6-10, 1995

(8) An extensive literature surrounds the debate: key works include: Ehrlich Paul, *Population Bomb*, Ballantine, New York, 1968. Meadows D et al, *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*, Universe Books, New York, 1972. Meadows D et al, *Beyond the Limits: Confronting Global Collapse and Envisioning a Sustainable Future*, Post Mills, Vt: Chelsea Green Publishing Company, 1992. World Commission on Environment and Development, *Our Common Future*, Oxford University Press, 1987. Relevant updating publications include the *State of the World Reports*, produced by the Worldwatch Institute and *World Resources: A Guide to the Global Environment*, published by the World Resources Institute.

(9) Daly, Herman, *Steady State Economics: the Economics of Biophysical Equilibrium and Moral Growth*, W H Freeman, 1977, with subsequent revisions and additions by the author, 1979, 1992.

(10) Siebert H, "Nature as a life support system: renewable resources and environmental disruption" in *Journal of Economics 42 No 2 pp133-142*, 1982.

(11) A good summary of current academic thinking on ecospace and sustainable development is provided in *Netherlands Journal of Environmental Sciences* (Special Issue: Environmental Utilisation Space). Volume 9, 1994/5.

(12) Musters CJM, de Graaf HJ, Noordervliet MAW and ter Keurs WJ, "Measuring Environmental Utilisation Space: Can it be Done?" in *Netherlands Journal of Environmental Sciences, Volume 9*, 1994/5.

(13) Advisory Council for Research on Nature and Environment (RMNO), *Towards Environmental Performance Indicators Based on the Notion of Environmental Space*, RMNO Publication No. 96, 1994. Also, Weterings R and Opschoor J B, "Environmental Utilisation Space and Reference Values for Performance Evaluation" in *Netherlands Journal of Environmental Sciences, Volume 9*, 1994/5.

(14) Milieudefensie, *Action Plan: Sustainable Netherlands*, Amsterdam, 1992 (Dutch) 1993 (English translation).

(15) Friends of the Earth Europe, *Towards Sustainable Europe: The Study*, Friends of the Earth, Brussels, 1995.

(16) Rees W and Wackernagel M, "Ecological Footprints and Appropriated Carrying Capacity: Measuring the Natural Capital Requirements of the Human Economy", in *Investing in Natural Capital: The Ecological Economics Approach to Sustainability*, A-M Jansson, M Hammer, C Folke and R Costanza, eds. Washington Island Press, 1994.

(17) Friends of the Earth Europe, *Towards Sustainable Europe: The Study*, Friends of the Earth, Brussels, 1995. pp 45 (English edition).

(18) This point was made in the preparatory report to UNCED of the Latin American and Caribbean Commission on Development and Environment. Quoted in IIED, *Citizen Action to Lighten Britain's Ecological Footprints*, February 1995.

(19) The intellectual heritage of these ideas is traced in Bramwell A, *Ecology in the 20th Century: A History*, Yale University Press, 1989.

(20) Rees WE, "Ecological Footprints and Appropriated Carrying Capacity: Measuring the Natural Capital Requirements of the Human Economy", in *Investing in Natural Capital: The Ecological Approach to Sustainability*, (A-M Jansson, M Hammer, C Folke and R Costanza, eds. Washington Island Press, 1994. p 380.

(21) Bilateral Memoranda of Understanding on sustainable trade and other actions have been signed between the Netherlands and Benin, Bhutan and Costa Rica.

(22) This important argument is presented in more detail in, Segal, Jerome M, *Consumer Expenditures and the Growth of Need-Required Income*, Paper presented at the conference "Consumption, Global Stewardship and the Good Life", Institute for Philosophy and Public Policy, University of Maryland, September 29-October 2, 1994.

(23) An example of the standard attack on psychologically obsessive over-consumption in the North can be found in FoE Europe, *Towards Sustainable Europe: the Report*, pp 194-5.

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[63] Weterings R and Opschoor JB, "EUS and Reference Values for Performance Evaluation" in *Netherlands Journal of Environmental Sciences*, Volume 9, 1994/5.

[64] End use consumption is the point of departure for the *OECD work programme on Sustainable Production and Consumption*, draft copy, OECD, 3 March 1995.

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[66] See, for example, Weizsäcker v, Ernst Ulrich *Sustainable Technological Progress*, Paper presented to the Oslo Roundtable Conference on Sustainable Production and Consumption, Oslo 6-10 February, 1995. p 8.

[67] More information on the sectoral maps can be obtained from the US EPA, Office of Strategic Planning and Environmental Data, Future Studies Unit, 401 M Street SW, Washington DC 20460, USA. Tel. +1 202 260 6523/6514. Fax +1 202 260 4903/2704.

[68] The current failure of the Netherlands to meet its NO_x reduction targets is largely due to the persistent increase in traffic volumes, despite intensive government efforts to encourage the use of public transport, bicycles and footpaths.

Annex B

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